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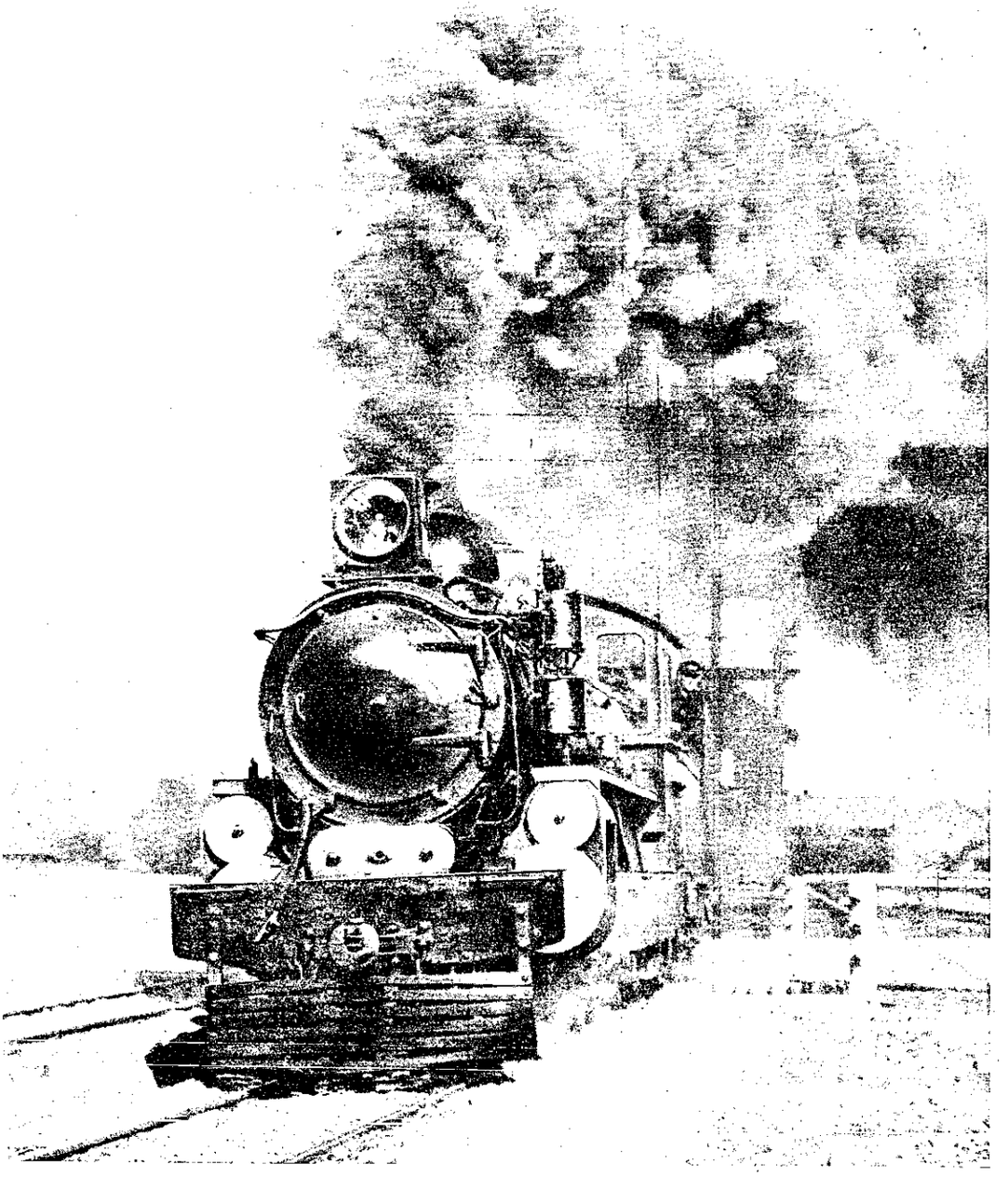

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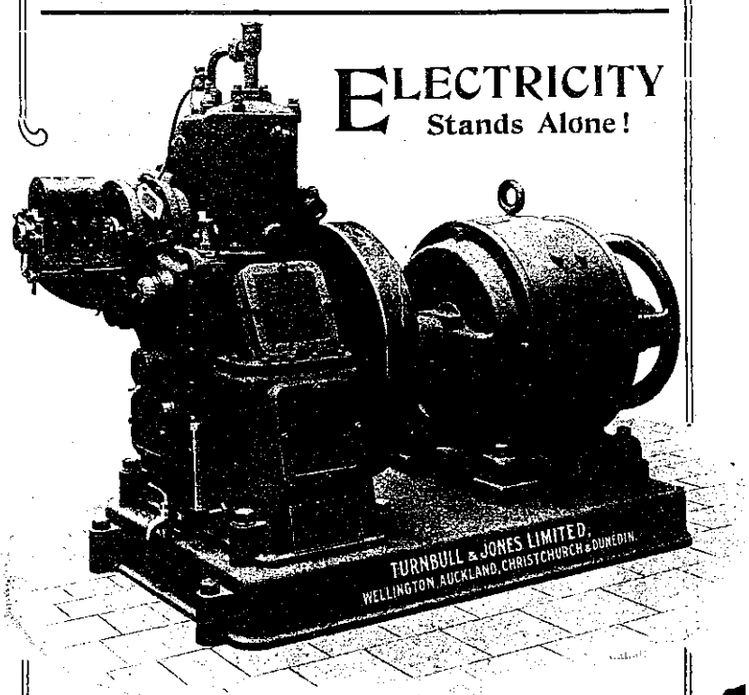

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EDITORIAL COMMENT.

We have in the Dominion an Act for compelling arbitration of disputes between Labour and Capital. It was once said to have proved a complete success. This was premature. It was also pronounced a failure. This was wrong. The truth was that it did not do everything expected because of the undue frictions of the system adopted. Many of these have been removed and the improvement is manifest. When they are all removed—and no one can tell when that will be, so vast is the field of experience still unexhausted—we shall have perfection. Capital is, we believe, persuaded that the way of the Act is the only way to prevent Labour unrest. Labour, on the other hand, is divided on the point. To a section more or less large the right of the strike is still dear. Ramsay MacDonald and Keir Hardie both told them, when they passed through the Dominion, that, deprived of that right, men were both slaves and cowards. That right is not taken away here. It is limited to unorganised Labour unconditionally, and in the case of organised Labour is subjected to certain conditions, the chief of which is that organised Labour must cancel its registration, and all labour must give a certain notice of its intention.

In Britain they have the right, without restrictions. Are they satisfied? On the contrary, they want to add the right of compelling other people to side with them. Not only did the railway and other men go out on strike, but they engaged in a deadly struggle to prevent other people doing any part of the work they had thrown up. Tom Mann was even giving "permits" for the doing of certain work. Tom Mann then was the chief of the state. It follows that Tom Mann was at the head of a rebellion, for the simple reason that neither he nor any one else has the right of stopping the service of the public. Men can cease work, but the public has the right to insist on a continuous supply of food and commercial transport and the permanence of light, water, and drainage. It is the business of the Government of the country to see that these things are not interrupted, for it is the business of the Government to see that every man's rights are exercised without legislation. Tom Mann giving permits usurps the function of the Government. Tom Mann was, therefore, a rebel. The State has to put down rebellion. Hence we had the police, the special constables, and the soldiery.

Every Government of the earth obeys this principle. Even the Socialist Government of M. Briand obeyed, and did so by the extraordinary and highly original and most effective method of calling out the reserves, which means making the strikers do their work as soldiers under military discipline. Were this principle forgotten society would crumble to pieces. Society is, when fortunate, founded on freedom, but it is freedom all round and proportioned accordingly. Under a proper system of freedom it is not possible for 200,000 men representing at the outside a million souls—giving each 200,000 a wife and three children—to dominate a nation of over forty millions of people. Strikes, when carried to their extreme—and they never stop short of it, for if they did they would be useless—are up against that solid fact which will not "ding." Now which is best?—subjection to a compulsory Arbitration system? or subjection to military and police forces:—"Undemocratic," some one raps out before he has time to think. But Democracy is the rule of majorities. Strikes, then, are up against majority rule, and they claim to be raised in its name. This is absurd. The absurdity follows from the supposition that it is wrong to compel arbitration. Strikes are absurd, therefore. Moreover, they are generally futile, and they invariably cost the strikers far more than they are worth. Such is the justification now afforded by the big strike in Britain to the principle of compulsory arbitration adopted in the Dominion of New Zealand.

* * *

Before industry was paralysed there arose a crisis between the Triple Alliance and the Triple Entente. That crisis was staved off but not removed. A period of uncertainty ensued. One felt that there might be war at any moment. During the period British industry and transport were paralysed. The crisis becomes acute once more. If the strike lasts the power of Britain to assert her strength in a certain event is paralysed. What is going to happen? Politicians who are statesmen and patriots send word to the Prime Minister from all sides of the House that they are ready to stand by him and ask no questions. But the strikers are deaf to the call of the public interest and the dictates of patriotism. It is a situation!

* * *

What is credit? It is the knowledge of the ability of production to give value. Were it coin, there would be no credit, for the coin in the world is worth only a fraction of the value of the production. Credit depends on permanence of exchange. Paralyse transport and you stop exchange. Credit totters. Keep it up long enough and there is disaster. Keep it up still longer and the disaster becomes national. Make the transport blockade universal and disaster becomes cosmopolitan. We do not allow children to play with fire. We ought not to allow either Labour or Capital to play with strikes and lock-outs.

* * *

Happily there is another danger. When compulsory arbitration was proposed here the scoffer said you can't put 10,000 men in gaol. When a universal strike by solidarity of Labour is urged (as it is urged every day by certain organs) one can safely say "Impossible." Without transport there can be no food after a short period, in the largest centres of population. That period over, the strikers will have no food for their strike pay to buy. It does not matter whether they are paid in diamonds or lumps of

clay. The more successful the strike, the sooner the collapse from starvation of strikers. The consideration of this logical fact ought to dominate the position. That's why we said "Happily."

* * *

It is clear to one who thinks straight that in these matters there must be compulsion, for as a matter of fact there is compulsion everywhere. It is the condition of the freedom guaranteed to every citizen by the ideal State. The first thing to do, therefore, is to accept Compulsory Arbitration. The next is to so manage that compulsion is always reasonable. As you can neither, on the one hand, imprison thousands nor on the other confiscate millions—for obvious reasons, chief of which is that capital must be conserved as one of the factors of production, which, indeed, is the very reason why you ought not to imprison thousands —who are another factor—you must impose conditions that shall reduce obstinacy and unreasonableness to the minimum. That done, you can easily deal with the minimum. Human nature (which is reasonable) is a guarantee for that. That is the path on which the Legislature of the Dominion is launched. Success gets nearer year by year. We go on amending and we rejoice that we can see our way to amend. Thoughtless persons call it "tinkering." But who pays attention to the thoughtless? They have begun that course in England with the Railway Conciliation Boards. The grievance of the men is that these Boards have been misused by the masters. That is proper subject for inquiry. If inquiry shows need there will be redress by legislation, and another step on the amendment road. The Government has offered that course. The men have refused—against the advice of their leaders. They must bow to the law of the strike. One thing is certain. Until there is compulsory arbitration on this line of amendment when needed, there will be industrial unrest all over the world.

* * *

There are men who insist that it is useless to talk of any improvement of anything until the world has ceased to be out of joint. The success of that talk would be the eternal block of all things useful. That the world is not an ideal place is beyond doubt to those who know how many things might be better. These are a vast army—anarchists, socialists, single-taxers, free-traders, protectionists, dreamers of many kinds of millennium. It is possible to respect their motives all round. It is impossible to wait for the reconcilement of all their differences. The work of order must never cease, even if good men wrangle about the good things to be done. Therefore, the work of preventing strikes by appeals to reason must go on.

* * *

As these lines go forward to the printer, the strike collapses. In a situation where somebody had to give way in one way or another, as we have shown abundantly, the masters have yielded. They have recognised that they must accept the principle of meeting the leaders of the men. It is a just principle, and the only one that can possibly lead to satisfactory conclusion. They have promised also to let bygones be bygones, and never to repeat the practice of black-marking a man who stands up for his cloth. Upon this open confession and firm promise of amendment there is built a great structure of reformatory work and progressive procedure which promise well. It may be groping in the dark? What of that—the groping is sure to reach the light eventually. Keep the spirit good and common-sense on the alert for rational amendment shown by patient experience to be needed. Then all will be well. Such is the lesson of this big strike.

* * *

The cry in some quarters is "Nationalisation of Railways." The strike has unquestionably shown that the companies for the most part have found the work of management too much for them. It is one of the reasons given for their fall into a state of things so bad for Labour, and for their inability to spend money enough to establish the right conditions for securing the right of Labour to better things. On the other hand some companies like the Midland have shown the best management. It is like the good employer who pleads that he cannot help it if the bad employer forces him to compete with sweating methods. The result of that plea is that the State has forced the sweater out; at all events it is so in this country. Shall the State be forced to do something to make a level among the railway companies? It is no business of ours. The Dominion has national railways, and offers not advice but the records of its experience for all who choose to read. No competition and payment of all charges with a small profit over, together with good wages (best in Australasia), short hours and low freights with many concessions to the railway users, and last, but not least, the lowest accident average in the world. How about accidents on the national railways of Australia? There they are under Commissioners, whereas we here are under the Minister. More than that it is impossible to say, and it covers the whole case for argument. Let those who argue do the covering. What is certain is that no political party in this country will ever propose to place the railways under the bushel of private ownership.

* * *

Last year was a good year for them. It is complained by politicians that the cost of the system has increased in the last five years by an inordinate sum. The increased expenditure of the period is £675,000. Is this an exorbitant increase? It is certain that in 1905 the railways were not paying the interest on their cost. Now they are. The concessions so freely granted in former years were left intact except the concessions on long distance passenger rates, and these were raised, but not up to level elsewhere prevailing. Moreover, some non-paying and unnecessary trains were cut out. *Prima facie*, then, the case looks for good not a bad management. Beyond that it is impossible for the critic to go without going into every item of the business. One knows, too, that the average of accidents is the lowest in the world: as that uncompromising opponent of the Government, Mr. F. M. B. Fisher, declared to the railway men the other day. The politicians having failed to establish a *prima facie* case against the management the case may be dismissed.

* * *

In another column—several other columns- we publish to-day a general review of the railway system, its history and probable future A pen of much reputation and knowledge has been engaged upon it, and his picturesque treatment will repay perusal. The best of his prophecies is that the Otago Central will become, thanks to irrigation, one of the best paying in the Dominion. We add that the first irrigation system has just been installed in the Ida Valley and the water is about to be offered to farmers.

The short battle of the gauges is given effectively; there is a good description of the Main Trunk Northern Express, together with the labours of the letter sorters in the mail van; there is a fine realistic touch of the engines, and the various parts of the journey. Whether his prophecy that the ferry system will be diverted by Picton will come true it is early to discuss. For the present the official face is firmly fixed against such a thing, on the ground that the speed of the east coast line must always fall short of the speed of the steamer on the shorter distance -Wellington to Lyttelton. But this is for the future.

* * *

Few men now know how the tunnel on this line came to be made. It represents, of course, the biggest project ever entertained by a British population—or any other—in proportion to its numbers. There were but 8000 people, including the babies, in the Canterbury Province at the time, and they faced with courage an expenditure running into millions. Had they failed it would have been no wonder. That they nearly failed is matter of history. That they were saved by a new arrival in the country who happened to be a young and brilliant geologist is known to but few, and their number grows daily smaller. When the engineer of the London Company, which had undertaken the contract subject to his examination of the data arrived, he set to work to explore the line through the Port Hills with a borer. After a time he came on porphyry. Thereupon he reported that the hill, being solid porphyry, the tunnel was beyond the means of the firm and out of the reach of economic profit. Moorhouse, then superintendent (William Sefton) had heard that a clever young German of the name of von Haast, had just written a grand report on an exploration of the Nelson Province. He sent for him in this crisis and commissioned him to survey the said hills. This he did, reporting duly that there was porphyry there, but that there were many other things there, less hard and less difficult for the work of tunnelling. The hill, he announced, was the side of a volcanic crater, an easy thing indeed to put a tunnel through. The circumstance is unique in railway history. On that report the tunnel was taken up by Messrs. Holmes and Richardson, and completed within the contract time. Haast, it is related, spent many week ends in the tunnel during its construction making drawings of the strata on either side of the working. These are now in the Christchurch Museum.

Engineering

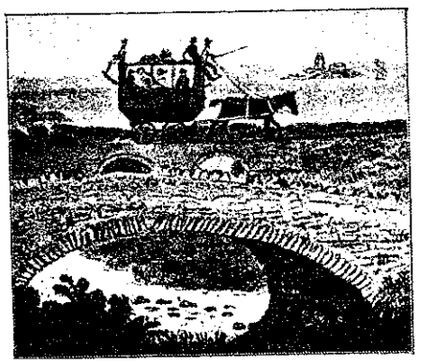
Our Railways

By Will Lawson

The First Railways.

The Beginning of Railways and a History and Description of the New Zealand Lines.

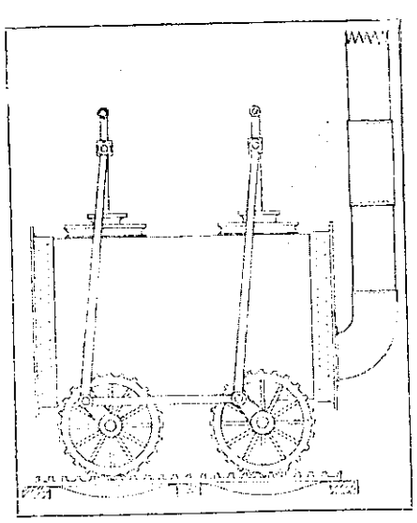
The birthplace of the railway is Great Britain, and though it is less than 100 years since the first steam trains ran, it is well over 100 years since passengers travelled in vehicles which ran on iron rails. The motive power, it is true, was a horse to each carriage, so these



FIRST PASSENGER RAILWAY.

early lines may more properly be termed tramways, albeit the more dignified title was given and has clung to them.

In the "Railway Magazine" of July, 1908, appeared an account of the oldest railway in the world—the Swansea and Mumbles Railway—a short line which connects these two Welsh seaside towns. An interesting special Act of Parliament, dated 29th June, 1804, incorporating the "Oystermouth Railway or Tramway Company" for the purpose of carrying stone and minerals. A passenger coach also ran. Four other such railways were authorised and built prior to this one, but as they have all been abandoned or absorbed into larger systems, the



BLENKINSOPP'S LOCOMOTIVE.

Swansea and Mumbles line, since 1877 a steam line, may be said to justify its claim to the title of the oldest railway in the world.

The first public steam railway was, of course, the Stockton-Darlington line, with which George Stephenson was so closely associated, and on which his engines were engaged, notably the "Rocket." On the second public railway, the Canterbury and Whitstable Railway, the trains were hauled by the immediate successor of the "Rocket," the "Invicta," shown here, being No. 12 engine to be built by George Stephenson, the "Rocket" being No. 11. Both engines are preserved as interesting relics of the days when steam railways had to fight for their existence against vested interest and bigoted prejudice.

Yet in spite of this opposition and restraint, as we know, railways have flourished apace all over the world. In the space of a century the motive power of each train has grown from the one horse-power of the Oystermouth Railway or Tramway Company to the thousands of horse-power contained in the enormously powerful bulk of the locomotive "Great Bear" of the Great Western Railway. The comparison presents a contrast indeed!

Everyone who has read the life story of George Stephenson, the founder of railways and the adapter of the locomotive to commercial use, will know how Parliament, by alternate interference and apathy, made the lot of the railway companies a hard one. Some of these restrictions were frivolous in the extreme. In 1842 no waggon was allowed to weigh, with its load, more than 4 tons, and no locomotive to travel faster than 12 miles an hour. Some towns would not have railways at any price, and many are now languishing on branch lines or without railways because of this stupid prejudice. Section 100 of the Great Western Railway Act, 1835, enacts as follows:—

"Notwithstanding anything in this Act contained it shall not be lawful for any company or any person whomsoever to form, make or lay down any branch railway or tramroad or other road or way whatever passing or approaching within three miles of the said College of Eton and connecting with the said railway hereby authorised to be made without the consent of the Provost and Fellows for the time being of the said College of Eton, to be signified by same in writing under the corporate seal."

And here is another amusing one:—

"Every locomotive steam engine used within the parishes of Burtonwood and Winwick shall be constructed on best principles for enabling it to consume its own smoke and preventing noise in the machinery or motion thereof, and no coal, but only coke or such other fuel as shall be approved by Lord Lilford and the Rector of Winwick shall be used or consumed on such locomotive on any pretence whatever."

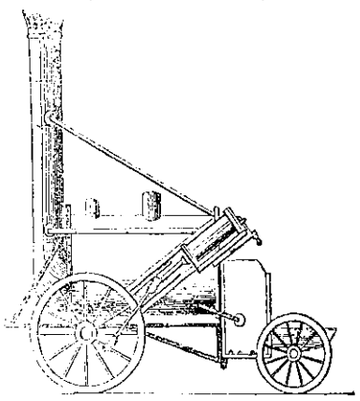
One can imagine the noble lord and the rector having a sample of coke sent in on a silver salver and solemnly discussing it over a bowl of punch. Were they living now and could they see the smoke-cloud made by a New Zealand engine on a hill, they would feel that their efforts had been in vain. Seriously, however, it would be a fine thing if such a by-law were in vogue in New Zealand.

New Zealand's Beginning: The Broad Gauge.

The first iron railway in New Zealand was laid between Christchurch and Ferrymead, now called Heathcote, and was the first portion of the Christchurch-Lyttelton railway to be opened for traffic. While Invercargill and Dunedin, and, later on, Wellington and Auckland, planned railways on the 3ft. 6in. gauge, which survives to this day, Canterbury, with truly British conservatism, laid her first railways on the broad gauge of 5ft. 3in. This fact and the subsequent alteration to the 3ft. 6in. gauge makes the history of the Canterbury system the most interesting to trace.

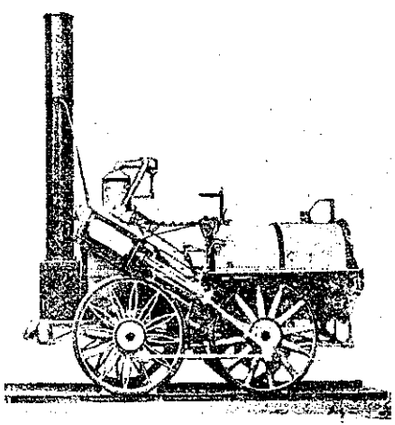
On 10th August, 1859, Mr. G. R. Stephenson made a report to the Provincial Government on the question of the best route for a railway between Lyttelton and Christchurch. No less than four routes had been suggested, three of which went by way of Sumner, and thence over and through the hills to the seaport. On one of these the grade was 1 in 19, and the terminus of the second route was planned to be 100 feet above the quay; to be precise, in Market Street, behind the Wesleyan Chapel. The only practicable route via Sumner was estimated to cost £327,632, with 3309 yards of tunnelling.

On the other hand, the direct route, which was subsequently adopted, necessitated only one tunnel 2582 yards long, and the cost was assessed at £245,071. A saving of three miles in distance was also effected, the Sumner route being 10¾ miles, as against seven miles by the direct route. As a footnote to his report this engineer remarked: "A line of railway from Christchuch to Port Lyttelton must eventually be the key to the whole system of the colony."



STEPHENSON'S "ROCKET."

With this magnified idea of the importance of the work, the Lyttelton tunnel was begun and the building of the railway on the broad gauge with 70lb. double-headed rails was commenced from Christchurch. In 1863 the line from the capital of the province to Ferrymead at the Heathcote River was opened. Merchandise for Christchurch from overseas was discharged at Lyttelton into lighters and small craft, and taken across the Sumner bar and up the river to Ferrymead, where it was loaded on to the railway to be carried to the town. The great Southern Railway was begun in 1865, when Samuel Bealey, Superintendent of the Province, made a contract with George Holmes and Edward Richardson to construct a section of line from Christchurch to the north bank of the Rakaia. This work went on very slowly, due to a great extent to the expense of transporting material by the river and the railway. However, in 1867 the tunnel was completed.



STEPHENSON'S "INVICTA."

Christchurch now possessed direct railway communication with the wharves. The capital cost was, of course, enormous for such a small community, and it is not, therefore, surprising to find, in 1872, the southern line being opened as far as Selwyn, that a special "tunnel rate" was levied, and a pretty stiff rate it was. For comparison, it is interesting to quote some extracts from a Canterbury ordinance of that

date, bearing on the freights per mile on the southern line and on the Lyttelton line:—

	Lyttelton Line.	Southern Line.
Merchandise ...	7d. per ton	4d. per ton
Grain	7d. per ton	3d. per ton
Sawn Timber ...	2d. per 100 super	1d. per 100 super
Wool (4 cwt. bls)	2d.	1d.
,, (over 4 ,, ,,	½d. per cwt.	¼d. per cwt.
Sheep, Pigs & Goats	1/- per 100	6d. per 100

The same ordinance mentions the passenger fares to be charged. These are remarkable in that the passenger who travelled four miles did so for less fare than he who travelled three miles. The rates were:—First-class, fourpence a mile exceeding three miles, under three miles 6d. per mile; second class, threepence a mile exceeding three miles, under three miles 4d. per mile.

At this time two great railway matters agitated Canterbury. One was the question of abandoning the broad gauge for the narrow gauge; the other was the transfer of the whole system to the General Colonial Government. In 1870 a report was made by Messrs. Bray and Marshman as to the relative values of the gauges. After comparing the costs of construction of lines and of rolling stock (waggons of 2¼ and 3¾ tons weight, and "light" engines of 12 tons as against "heavy" engines of 27 tons weight), these gentlemen reduced the argument as to whether the Northern Railway then being surveyed should be broad or narrow to three heads: (1) to build the line on the broad gauge; (2) build it on the narrow gauge and tranship at Christchurch; or (3) to build it on the narrow gauge and lay a third rail to Lyttelton from Christchurch. The second alternative found most favour in their eyes, and the report continues: "We propose, therefore, to make the narrow gauge terminate at Addington, and make that the station for Christchurch for passengers and goods. . . . As to the third rail to Lyttelton, it is more than probable that the necessity for it would not arise. We have estimated the cost of transhipment of 20,000 tons (per year) at Christchurch at £2000. Within no time with which we are concerned will the country north of Waipara Plains yield 20,000 tons freight per annum 'unless a line were made to the Hokitika coalfield.' We do not stop to consider what the effect would be of breaking up the existing line from Lyttelton to Christchurch and laying down in its stead a double line in the narrow gauge. We cannot imagine that a proposal, involving as this would, an immense outlay, the disruption of the business of the country, and the substitution of a system far less efficient and more costly to work, could for a moment be entertained."

Despite this dignified argument, in 1873, when the Colonial Government took over the railways, the broad gauge was discarded. All the rolling stock was sold to the South Australian Government, and was shipped in the ship "Hyderabad" to Adelaide. The vessel was wrecked on the Otaki beach, from which place the railway material was brought, after salvage, to Wellington, where it lay on the reclaimed land awaiting re-shipment. Such was the inglorious end of the broad gauge in New Zealand. Its passing was a foregone conclusion, for, though it suited the level lands of Canterbury, in other parts where the railways skirt sea cliffs or pierce mountainous country, the building of the lines on the broad gauge would have been very costly.

ADVENT OF THE NARROW GAUGE.

Bluff-Invercargill Railway.

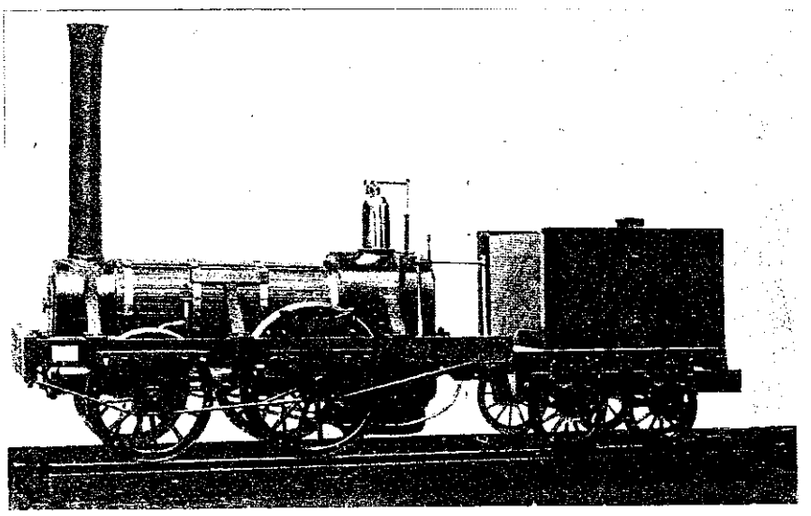
At the time of the opening of the broad gauge railway between Christchurch and Ferrymead, the good people of the most southern New Zealand town began to feel the need for communication by rail between Invercargill and her port, 17 miles away, and also between Invercargill and Winton, 19 miles inland. In the year 1863 the Southland Provincial Council passed ordinances reserving land for the construction of these lines, which were known, respectively, as the Bluff Harbour-Invercargill Railway and the Oreti Railway. Messrs. A. Cairns and J. McKenzie, contractors from Dunedin, who had been asked to report on the matter of a route for the Bluff Railway, recommended, amongst other things, that the line be built strong enough to carry light locomotive engines, but for a beginning and until the district carried a population of 60,000 souls, that horse-haulage be utilised. By this means the cost of locomotives at £1700 each and waggons and carriages would be saved, since the horse vehicles could be built by local labour. They considered that goods would constitute the principal freight, but suggested that a passenger car from each end be run at morning and evening, the cost of which was estimated at £10 a day, or four trips at £2 10s. each.

In 1864 a short piece of the line was opened, but progress appears to have been slow, while the contract price for building the line had been much exceeded. So much so that on 22nd June, 1865, the Council resolved to appoint a commission of impartial and competent engineers to be selected from some place other than Southland for the purpose of inquiring and reporting upon the excess of expenditure over the contract prices."

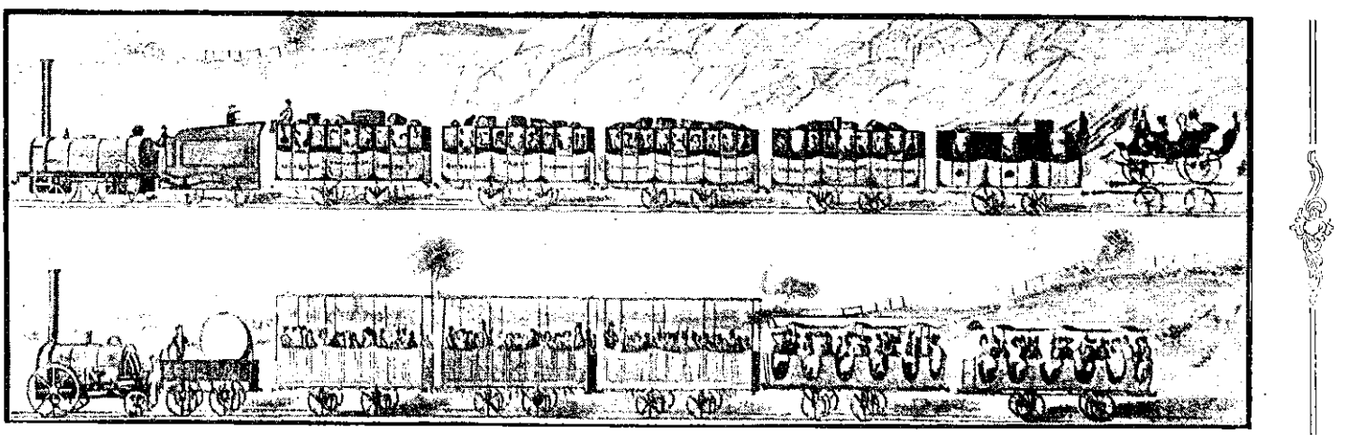
There was also trouble with the Oreti line about this time, and Dr. Menzies asked the Government "What steps it proposes to take to complete the Oreti railway to Winton or put it into working order, and whether it proposes to complete it with wooden rails only." In reply he was informed that it was intended to obtain estimates to complete the railway with iron rails. In 1866 a contract was made, the first one having been cancelled, with Messrs. Smyth, Hoyt and Co., to complete the Bluff line, the price being 25,000 acres of land. However, the contractors, on the completion of the line in 1867, received also £23,000, which provoked from a councillor the query whether they had paid in full for the completion of the line, exclusive of the terminus at Bluff, and, if so, whether the work had been passed as completed by the Provincial Engineer, and, further, how it was that the line was open for goods and not passengers, "except the friends of the Railway Engineer"? In the report of the proceedings of the Council it is stated that "the Provincial Treasurer replied"! How to work the line was a troublesome question, and for a long time an arrangement was under consideration to lease the railways. Bills to authorise this were made law, but it does not appear that anything in this direction was ever done. At any rate, nothing of any permanent nature was arranged, and the Provincial Council set up a Public Works and Railways Department which was eventually taken over by the General Government.

As showing the primitive nature of the railways, the following list of salaries, wages and costs of running the partially finished Bluff line in 1866 is interesting:—

Locomotive Engineer	£240 per annum
Engineman	208 ,,
Fireman	156 ,,
Shedman	140 ,,
Blacksmith	208 ,,
Repairer	187 ,,
Labourer	140 ,,
Fuel, grease and small stores ..	1000 ,,
Traffic Manager	250 ,,
Station Agents	400 ,,
Guard and Porters	655 ,,
Books, Tickets, etc.	150 ,,
Incidental	100 ,,



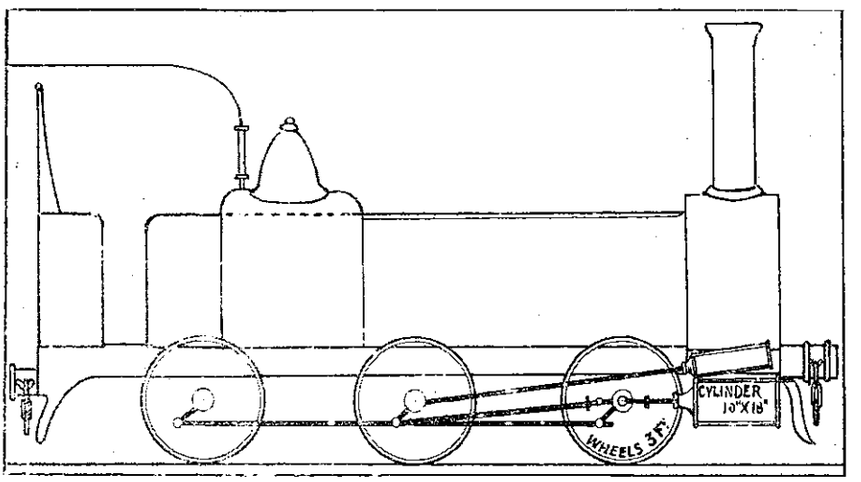
"OLD IRONSIDES"—FIRST LOCOMOTIVE BUILT BY THE BALDWIN WORKS, 1832.



FIRST AND SECOND CLASS PASSENGER TRAINS, 1830.

An overpowering expense account for so small a railway system! It will be observed that the engine driver was paid at the rate of 14/- a day, which is approximately what the present drivers are striving for.

From these small beginnings grew the present railway system of Southland and Otago. Between Dunedin and Balclutha a line was opened in 1873, which eventually met the Southland line and formed the trunk line between Dunedin and Invercargill. Through an unfortunate accident drawings and photographs of the early Bluff Invercargill line have failed to arrive in time for inclusion in this article. The illustration of the first locomotive to run on the Balclutha Dunedin section will, however, give some idea of the rolling stock used in those days.



OTAGO SOUTHERN TRUNK RAILWAY LOCOMOTIVE ENGINE, 1872. (Scale ¼in. to foot).

Weight, 17 tons, with coal and water; 120lb pressure; six-coupled; wheelbase, 16ft. 10in. To burn brown coal or lignite. Height of funnel above rail, 10ft. 6in. Brakes on all wheels. 40lb rail. Maximum grade 1 in 50.

FIGHTING THE MOUNTAINS.

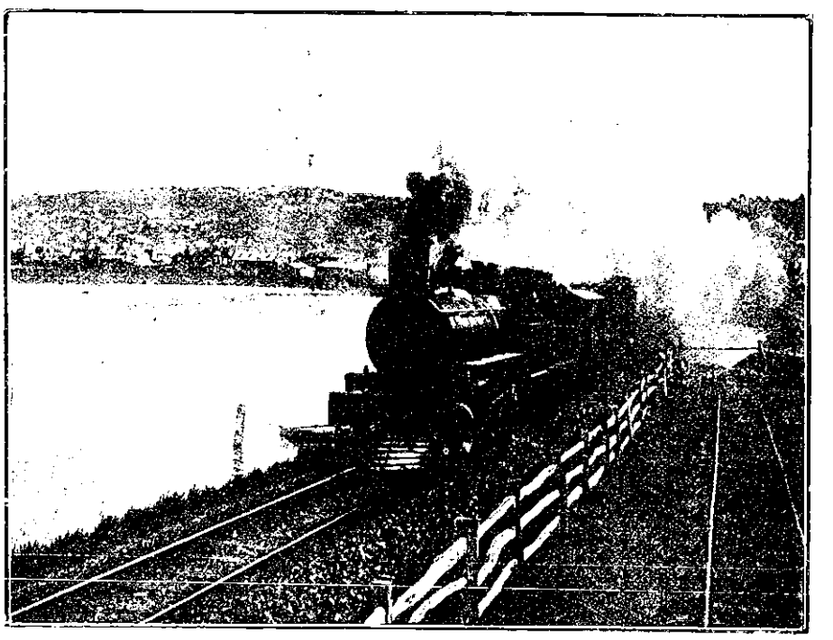
The Midland Railway.

The Southern Alps stretch their great length from the south to the north of the Middle Island, forming a long rampart between the east and west coasts, and very early in the history of the provinces thus separated men recognised that sooner or later this rampart would have to be crossed or pierced by road or railway. The project to build a railway across the Alps was a bold one, and, strangely enough, the province of Nelson was as keen as Westland and Canterbury in urging the necessity of the work. Nelson was a busy port then—all the intercolonial steamers called and there were many farms extending over the miles of fair lands of the province.

The West Coast then carried a large population (Hokitika held 20,000 souls), the gold-mining being at its height, while the coal and timber industries were just beginning. So there was an excellent market offering for the produce of the farms, and coal and timber would make good loading in the return trip. Nelson made the first move by building a railway to Belgrove, 22 miles inland. To-day the line extends to Kiwi, 48 miles from the port of Nelson, only 26 miles having been added in all these years. In 1878 the agitation began in Canterbury for railway connection with the West Coast, the line to continue thence to Nelson, a total distance of 235 miles through country for the most part of a forbidding conformation. Two years later the Westland Railway League came into being, representing Westland's share in the agitation. At a meeting of this League a public subscription was made to defray the cost of a flying survey of a route from Christchurch to Greymouth by way of Reefton, and two surveyors set out to reconnoitre the enemy, the grim old mountains, and make the first survey. Their names were Thornton and Brown. They laid out the line, which was known as the Cannibal Gorge route, lying far to the north of the present line. For engineering reasons it was afterwards abandoned, which seems a pity; tourists would have come from afar to go through a Cannibal Gorge, comfortably seated in a Pullman car. At Lewis Pass, the highest point of this route, the line would have been 2550 feet above the sea, and there were sixteen tunnels planned, the longest one just over two miles in length. Two million pounds sterling was to have comfortably covered the cost of construction. The second route to be surveyed was that known as the Hurinui route, further south than Cannibal Gorge, and north of Arthur's Pass. This line was to have 34 tunnels, 8½ miles in the mountains being alternately viaducts and tunnels. The longest tunnel was to have been at an elevation of 2360 feet above the sea, and to have a length of 3½ miles. An alternative route avoided some of the tunnels, and provided for haulage on one side by wire cable up grades actually as steep as the roof of a house, and on the other side by Fell locomotive gripping a centre rail. In June 1881 a deputation waited on Premier John Hall to inform him that it was proposed to form a company with a capital of £1,000,000 to build the line over the first-mentioned Hurunui route if the survey proved satisfactory to the Government, which was to be at liberty to take the line over in sections as completed. Cabinet obtained a report from the Government engineers, who estimated the cost at £1,500,000, and the total length of line at 158 miles. As there was no legislation providing for private companies undertaking public works, a Bill was passed giving the necessary powers. Then the promoters approached the Christchurch Chamber of Commerce with a request that delegates be sent to inspect the route. The delegates went and on their return they reported adversely so far as private enterprise was concerned. They suggested, however, that Government should be urged to build the line at once.

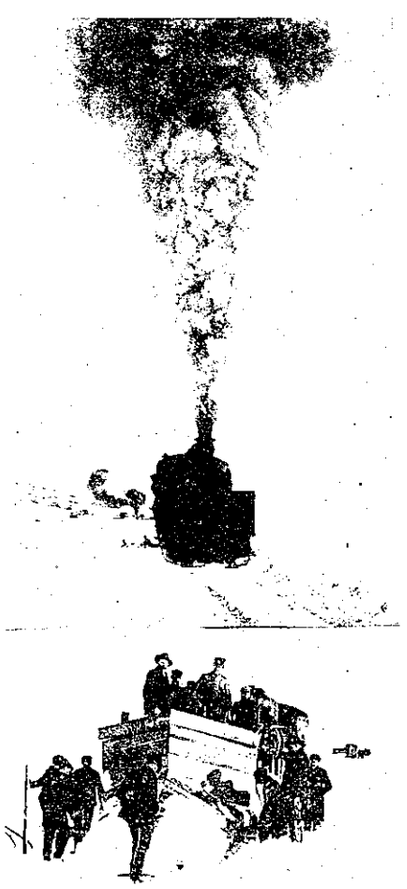
Another Railway League was formed, the Canterbury League, and it amalgamated with the Westland League and succeeded in having a Royal Commission appointed to inquire concerning the feasibility of the proposal to build the Hurinui line. In February, 1883, the Commission reported that it could not recommend the extension of the main line of railways northward to Hawarden, and thence across to Westland. A few months later another Commission advised that the best way lay almost due west from Christchurch, from Springfield over Arthur's Pass to Brunnerton, but it could not see that the line would pay more than actual working expenses. In the same year an arrangement was made by a syndicate with the British and Foreign Contract Company to construct a line 150 miles long from Springfield to Brunnerton, over Arthur's Pass. But before this was ratified the syndicate was re-arranged in different terms and three delegates were sent Home. As a result of their inquiries, in January, 1885, a contract was entered into between the Governor (for the Queen) and Messrs. W. Chrystall, J. T. Ford, J. T. Matson, T. S. Weston, G. Hart, J. H. Cock, C. Y. Fell, H. D. Jackson, A. Pitt and J. Sclanders to construct a line from Springfield to Belgrove by way of Brunnerton in Westland, a total distance of 235 miles, at a cost of two and a half millions, the syndicate to receive grants of land in proportion to the extent of railway completed. This is known as the "Chrystall Contract," and the gentlemen concerned were leading men in the three interested provinces. But the syndicate had difficulty in raising funds, and while matters were in abeyance from this cause, Messrs Meiggs and Sons, South American contractors, appeared in the arena. They offered to build the line in five years at a cost just under four millions sterling if the Government would guarantee a half-yearly revenue of ninety-seven thousand sovereigns, for a period of twenty years. By 34 votes to 27 this proposal was rejected, after being reported on by a Select Committee, and Meiggs and Sons disappeared again, leaving behind them as a record to be filed and preserved with the other records of this battle with the mountains, the boldly-conceived "Meiggs Contract."

In 1886 the New Zealand Midland Railway Company was formed in London, the promoters being the original Chrystall syndicate. The capital of the company was half a million sterling, of which sum one-half was paid up. Lloyd's, Barnett's, and Bosanquet's Bank, of London, receiving applications for £10 shares. The line from Springfield through to Belgrove was estimated to cost 2¾ millions, and land to the value of 1½ millions was given by the Government. Early in the proceedings the company asked that, in the event of the land not realising that figure, the New Zealand Government would guarantee the amount. But the Government declined, and this was the first of the many differences between the ill-starred Midland Company and the Government. The route laid out was practically that by which



DUNEDIN-CHRISTCHURCH EXPRESS HAULED BY CLASS "V" ENGINE.

the rails are led across the Alps to-day, except that the tunnel planned at Arthur's Pass was at an elevation of 2530 feet, and had a length of a little over three miles, whereas the tunnel now being built is 5½ miles long, and pierces the range some distance lower down the mountain sides. Yet short as it was, the three-mile tunnel was the knotty part of the problem the company had to solve in order to cross the ranges. In 1888 the company decided to avoid the tunnel and cross the Pass by means of the Abt, or Fell system of haulage, whereby specially-designed locomotives, clutching a centre rail or rack, climb very steep ascents. Then it was suggested to have a switch-back in conjunction with the Fell line, and again the switchback was discarded in favour of a tunnel three-quarters of a mile long on a grade of 1 in 15, to be worked by Fell engine. The Government engineers would have none of this, however, stating that the smoke would stifle every person on the train in the course of the slow ascent. And while the tunnel question was discussed, the line on either side was crossing deep gorges and piercing mountain spurs, creeping slowly towards the mountains like two wings of an army bent on overcoming a powerful adversary and making every preparation for a complete victory. Patterson's Creek and Staircase Gully have been crossed on the eastern side, and now the line is at the Cass. On the west, Otira, three miles from the tunnel is the rail head, but the line moves on apace. Even after the Government took the line from the Midland Company, the engineers sought some means of avoiding so long a tunnel. But it was not to be avoided. In 1907 the Government, taking its courage in both hands, like the legendary Indian chief, began the task of hewing a way through the heart of the mountains, and has heeded not the voices and the sounds as of clamorous enemies. And the mountains are yielding to the onslaught and are giving their torrents to provide the power



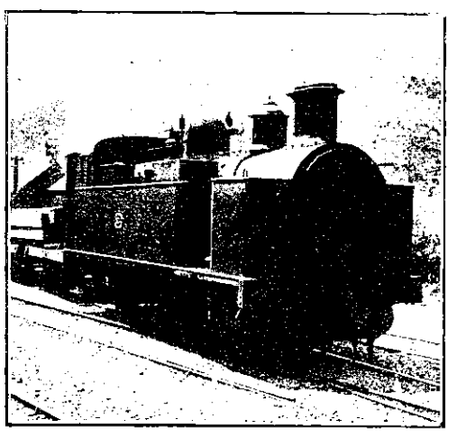
SNOW PLOUGH AT WORK IN OTAGO CENTRAL.

to drive the drills that tear their rocks apart. The Devil's Punchbowl, which has a fall of over 700 feet, will supply 600 horse power to the work at the Otira end of the tunnel, which is now bored for a distance of 1½ miles on its up-hill progress towards the Bealey. At the Bealey end electric energy will be provided by Holt's Creek. Not only are the forces of the mountains being pressed into service to bore the tunnel, but when it is completed in some five years' time, electric locomotives, driven by the same forces, will draw the trains up and down the rather steep grade which will occur in the tunnel. It is interesting to note, in mentioning this employment of the water power, that an alternative route over Arthur's Pass, surveyed in 1884, provided for rope haulage over grades varying from 1 in 7 to 1 in 50, the power to be derived from the waterfalls in the neighbourhood. More than three hundred men are employed in boring this long tunnel, and its cost will be £600,000. It was before such figures as these that the early builders quailed, yet in all the years of vacillation, there was not an engineer but knew that, after all, there was no other reasonable way save through the mountains. The question of what may be met with in the course of the exploration underground fills the imagination with wonder. When the Lyttelton-Christchurch tunnel was being made, a large cave was broken into, and it saved the contractors some distance of drilling. And in Otira Tunnel the interesting question of the heat gradient of the earth is to be tested by a Tunnel Committee of the Canterbury Philosophical Institute. To do this bores are to be made in the walls of the tunnel, running in about six feet at intervals of 200 yards, from end to end. And out on the snow-clad slopes, and across the ridges along the line of the tunnel, thermometer readings will be taken. By comparing the inside and outside readings the earth's heat gradient will be ascertained. When the line is through, it will mark the realisation of the dreams dreamed thirty years ago in so far as the railway connection with Christchurch and Westland is concerned. There will yet remain the line from Reefton to Kiwi to connect Nelson. Nelson, to-day, however, is not the busy place in proportion to her sister cities of thirty years ago, and from the lethargy of perpetual summer it is difficult to arouse the Garden City. So it may be years ere the remaining link of the bold railway scheme, which the gentlemen of the Midland Railway Company conceived, is completed. Yet the East will have been linked with the West, the snow-clad Alps pierced, and Man, the inquisitive, restless, rock-tapping, earth-boring animal, will be triumphant over his tunnel, the longest in the Southern Hemisphere, and one of the long ones of the world, and maybe the gods, seeing the tourist trains disappear beneath the range and emerge, will laugh at the quaint sight, and perhaps they will be able to see the hole.

THE SNOW PLOUGH IN NEW ZEALAND.

The Otago Central Railway has, with a certain amount of injustice, been styled the "white elephant" of the New Zealand system. It extends for 143 miles from Dunedin in a north-westerly direction, and for the most part traverses high and barren-looking land, though it is claimed that under irrigation the land will grow anything. The logical conclusion of this much-discussed and, at present, unprofitable line is at Lake Hawea, where splendid wheat lands lie. Such an extension and a scheme of irrigation by which the splendid water supply of the adjoining rivers would be spread over the land, would make the Central Otago line one of the best-paying in New Zealand.

In the course of its wanderings the line, after passing through several rocky gorges, attains a considerable altitude, its highest point, at Wedderburn, being 1770 feet above the sea. This place is reached after climbing for ninety-four miles from Dunedin. Here the country consists of high table-lands, exposed to storms in winter and blazing sunshine in summer. In July, 1908, a snow storm set in, covering the high lands in a mantle of snow and effectually blocking the railway. One train was cut off completely from communication with Dunedin, and the locomotive of this train set about the work of clearing the line of snow. She was a 65-ton engine, No. 332. An ingenious plough was rigged on this engine. A stout beam was fastened from the point of the cow-catcher to the top of the funnel, resting also against the smoke-box. Then, all round were arranged timbers, bound with iron, the lower extremities being attached to the frame of the cow-catcher, while the upper ends centred round the funnel. The engine during the continuance of the storm, patrolled and repeatedly cleared the line, but her efforts were frustrated by the falling and drifting snow. Meanwhile a snow-plough had been built at Dunedin to be fitted to a waggon. Another engine, No. 337, took it, together with a special train, up to the scene of action, the district engineer being in charge. This official, after inspecting the improvised plough arranged a battering ram which consisted of engine No. 332 in the lead, a heavy double-bogie waggon and No. 337. The new plough was carried in the waggon ready for fitting up, should the other prove ineffectual. Then the giants steamed out to make war on the snow. At first the fall was two feet deep and was easily scattered. Gradually the depth increased and the plough made a fine stir among the snow as it tore it aside, rolling it out in glistening waves which trailed away behind at about the level of the foot-plate. Sometimes a huge snowball would form, to be rolled aside, and perhaps it would tumble back against the side-rods. Then the ball vanished in a whirl of whiteness. Soon the drifts increased in height till they banked up as high as the smoke-box crown, and the engine at last stuck, her



FELL LOCOMOTIVE USED ON RIMUTAKA INCLINE

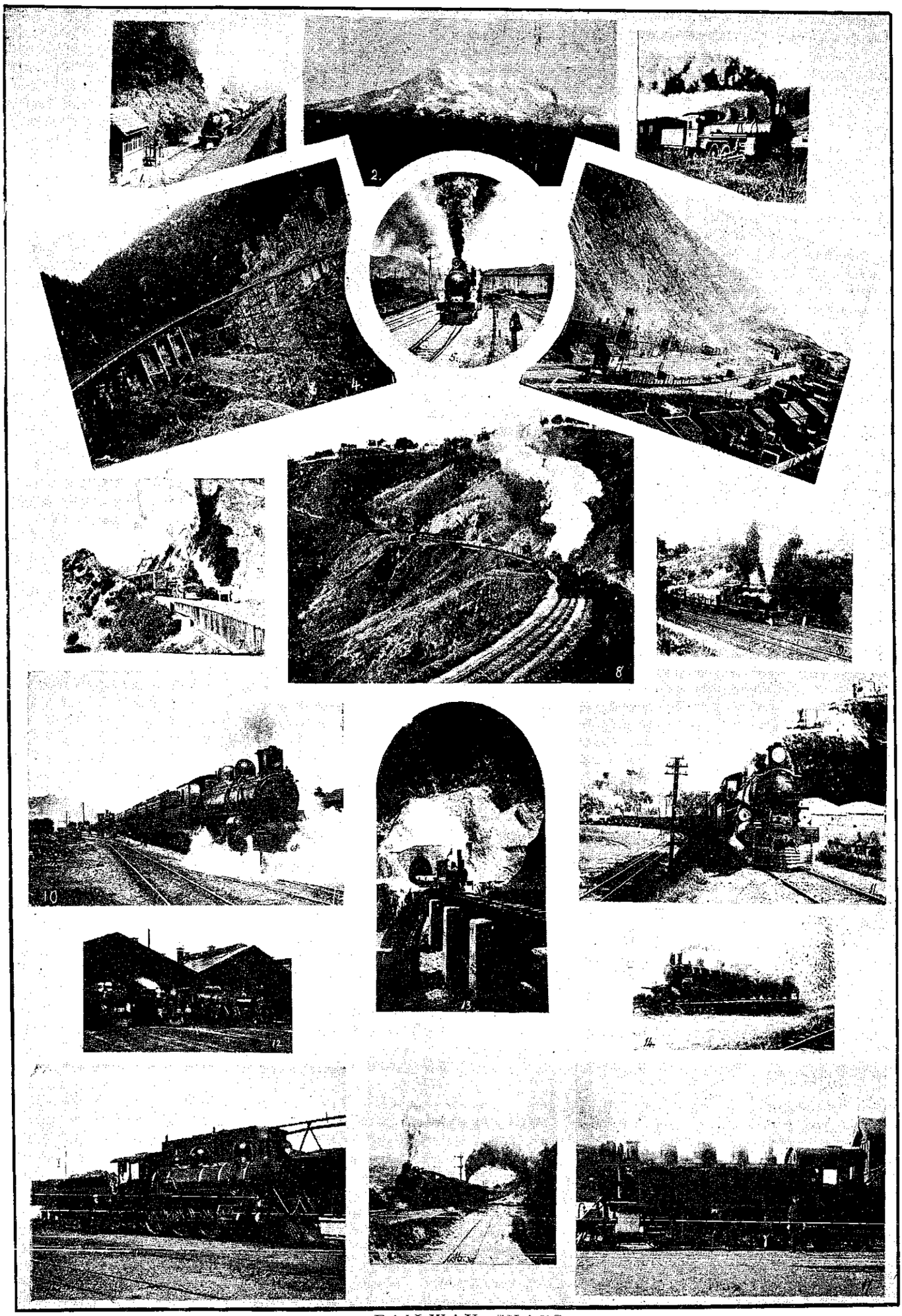
wheels racing on the ice-caked rails. After an effort she was freed and the machines retreated to gather impetus to charge the obstruction. They went at it, 140 tons of dead weight, and when they struck the snow-bank there was a perceptible shock, the snow rising and writhing for some distance ahead like the jumble of a cross sea. Again and again this was repeated, until the front engine was derailed. Placing her on the metals was a difficult task, as the snow was a solid mass all around her, even between the spokes of her wheels. But by using powerful jacks, it was accomplished just after dark. In the gathering darkness a strange scene was presented in the red flare of kerosene torches; and all around lay the desolate wastes of snow.

Next day, No. 332 was despatched again to the drifts, while the new plough was fitted to the waggon which had been loaded with rails to keep it on the track. In two hours' time 332 returned for water, having gained a chain and a half. No. 337 then pushed out the new plough which accomplished more than the first plough did as it was made with a greater angle for lifting the snow. It tossed the snow up in gleaming clouds. A clear path was won to the summit of the line, the whistle blowing a cock-crow when this was attained. Running down hill she raised the snow in a stinging cloud.

Then word was received that No. 332 which was to follow to assist if necessary, was stuck in the snow. So 337 took water and returned with the object of assisting her. It was freezing so hard that icicles were forming on the sides of the engine. At a station, a ballast engine, standing on a siding had a fire burning under her tender to prevent the water-pipes from freezing. The relief engine soon found herself in difficulties, owing to ice on the rail and the attempt was abandoned for the night. A message was sent afoot, instructing No. 332's driver to come in till morning, and leave his engine, but he said he would stay where he was. He covered the cab and tender with a waggon tarpaulin and spent a fairly comfortable night. In the morning the engine's tanks had to be filled by means of buckets, an operation occupying one and a half hours.

After three days' arduous work the line was finally cleared and traffic, which had been interrupted for a fortnight, was resumed.

Such snow blockades are unusual in New Zealand, but now that the railways, which have for too long been hugging the level coast line, are being extended into the highlands, these



RAILWAY SNAPS

1. Main Trunk Train outside Auckland. 2.—Mt. Ruapehu from Waiouru Station. 3.—Dunedin Express leaving Oamaru. 4.—Hapuawhenua Viaduct. 5.—Leaving Thorndon Station. 6. Paekakariki Station. 7.—Train leaving No. 1 Tunnel. 8.—Manawatu Line near Ngaio. 9.—Train emerging from Cutting. 10.—Trains at Thorndon Station. 11. Train leaving Thorndon Station. 12. Auckland Engine Sheds. 13.—Ballast Train, Midland Line at Slovens Creek. 14.—Engine on turntable. 15.—Engine "UD." Class. 16.—Train leaving Ngaio. 17.—Engine "WJ." Class.

Photos Nos. 2, 4, 6, 10, 11, 12, 15, 16 and 17 by P. Pattle. Photos Nos. 1, 3, 5, 7, 9 and 14 by F. G. Layton. Photos Nos. 8 and 13 by J. N. Taylor.

conditions are always possible. It would be a sight indeed to see a huge X engine rooting the snow from her path.

AUCKLAND TO INVERCARGILL.

The North Island Main Trunk Line.

The mail train for Wellington leaves Auckland at 9.15 p.m., and makes no stop till Mercer is reached, 43 miles distant. In the interval of traversing this stretch of line, through passengers usually dispose themselves comfortably for the night, the fortunate ones in berths in the sleepers, others in the Pullman seats with which both first and second-class cars are fitted. All the cars are heated by steam. Excluding the men on the engine, whose efforts and vigilance carry the train safely over the night-shrouded road, the busiest men on the train are the mail sorters. There are two mail-vans on the south bound mail train, one for letters and one for newspapers and half a dozen men are at work in each. The mail bags have been opened, and in the letter van, the mails from Great Britain are sorted through to separate the post cards from the letters.

The interior of a postal van gives little idea of the amount of work transacted in it, so far as equipment is concerned. The appliances are of the simplest and the celerity of the sorting depends on the skill of the men. The new vans are fifty feet long. At one side is a bench on which stands a hand-driven variety of the stamping machine used in the Central Post Offices. Near to it is a lavatory situated in the centre of the van next to the big sliding side door. Further along are racks for the sorting of letters. On the other side of the van there is a sofa, set in a little alcove. Also a horizontal iron frame supported by uprights, and consisting of a number of squares. To each of these the mouth of an empty mail bag is hooked, being held open by the square of iron. This appliance is called the hoppers. The sorting is done into these, fresh bags being substituted as they are filled. And here and there and everywhere are bags and bags of letters, cards and registered packages. To the outsider chaos seems to reign in the gas-lit van when first the bags are opened. Haste is the watchword. The skilled and quick brains send the letters swiftly to their appointed places. There is no labelling of the hoppers. The mind has learned just where the Hamilton or Palmerston North bag is, the hand has caught the trick of giving the correct fling which will land the missives, which for the moment have become missiles, into the correct bag. The eye is rarely raised from the bundle of letters in the operator's hand. There is here an accuracy of a very high order, mistakes being rare.

To the unbeliever let it be told that the sorter is fined for every mistake he makes.

The letters for the nearest district post office are being selected from the mass. Then they are whirled through the stamping machine at a giddy pace. Any that are too unshapely for its elastic maw are hand-stamped, as are the packets among the registered matter. Then the ordinary letters and cards go into a plain bag or bags, the registered letters go into a pink-tipped bag while the registered packages are packed into a strong basket. In the van ahead the newspapers and large packets have been sorted in the same speedy manner, expert hands shying them into distant hoppers with a skill which would break the heart of a keeper of Aunt Sally at a country show. They hit the bull's eye every time.

When the great express engine whose steady beat has marked time to the swift movements of the sorters, blows a warning signal at the approaching station of Frankton Junction, the bags and baskets for that centre are all ready and the sorters take short respite, snatching a few puffs at cigarettes and pipes.

The whistle calls through the starlit night, the steam thrashes, and as the wheels rumble once more, the mail-sorters turn to their tasks again. On a busy night, with Brindisi, Australian, and local mails on, the demand for speed is great, and the men rise to the demand. The spirit of competition, which will stir a man's blood in any kind of work, is here. But instead of a human competitor, they are fighting man's old adversary, Time. The big engine in front is fighting Time too. She must be at her destination at a certain time and the men of the postal staff must have their mails ready when she gets there. So the wheels spin and the hands fly that the King's Mail may pass over the land and cross the Straits to the land beyond, on time. The wheels hammer and roar below, the long vans sway and the letters are marshalled and dismissed, recalled and inspected, scattered here and there, battalions of them. A man will shout a jest to a comrade at the other end of the van, or someone, opening the door to pass into the next van, raises a storm of protest as a cloud of bitter engine smoke blows in. In the tunnels this smoke is a trial, as the ventilators and side-doors are always kept open (the doors slightly), for the vans get very hot with the heat of toiling men. No railway men disturb them, being next to the engine, they are not in the thoroughfare of the train, and are spared the discomfort of the passage of guards and ticket clerks.

After the first few hours' rush and the disposal of immediate mails, there is a chance of a few minutes' rest for one or other of the men. It is taken, perhaps on the little sofa, at full stretch. But it is of short duration. Towards dawn, if the work of the gang is finished, they may take it easy. But there is a spirit of fellowship among them, and they may give the work of the next shift of men a start if it promises to be heavy. Presently, at the head of the Wanganui the train stops and the engine, which has run all night, goes coughing away to the sheds. And there comes out of the mists of the engine-yards one of the biggest type of locomotives in New Zealand, to take the King's Mail across the mountains. One of the tired sorters watching them coupling her to the train shouts to her driver:

'Morning, Sam. We're right on time. Mind you don't lose any on the hill."

The answer is re-assuring.

"Not this one; she'll pull the labels off the luggage."

The morning mists are clinging to Taumaranui, the village that is the meeting place of the Wanganui River service and the railway, the village that stays awake all night to receive and despatch travellers by train and steamer, and sleeps all through the idle days. As the powerful engine slogs heavily up the straight grade that presently crosses and for a long way skirts the head waters of the beautiful Wanganui, the sleepers arouse themselves from comfortable beds to watch the landscape passing, river glimpses and dew drenched bush pictures, just warming in the morning glow, with here and there a peep of distant snow peaks. And the men on the engine that pulls so easily up, up by cutting and sweeping curve, with no eyes for the morning picture, centre all their attention to the work that will claim them till the ninety miles that lie between Taumaranui and Taihape are left behind.

Past Kakahi and Owhongo to Oio—surely the shortest railway name in the world—and then the grades begin in earnest. The furnace yawns for coal the fireman mops his brow. Presently her whistle cries in shrill notes that ill become her leviathan dimensions, warning passengers that Raurimu station is at hand, and telling the station folk that she is here on time to the second, and the labels still on the luggage.

Under way again, and now well warmed up to her work, the locomotive makes haste to gather speed on the level stretch below the spiral. It is a brave effort, and when she meets the rise she has attained some pace. Looking back, one may see where the ascent begins. Some of the cars are on the level. One by one they lift to the 1 in 50 grade until the whole train is hanging heavily on the engine's draw bar. Round to the left she sweeps and faintly can be heard the flange of a carriage wheel crying at the curve. Round and upwards for a mile, then 100 feet below lies Raurimu station. One mile to gain 100 feet—that is approximately the achievement of the spiral. It is the connecting line between the valley that dips away to Taumaranui and the plateau of Waimarino, which terminates abruptly at this point. It is as though a man was on a high platform with a stout post at the end. To reach the ground he must either jump or clamber down the post. The Spiral clambers up and down the post, which is a round hill with wide spurs.

There is never a slip from the eight driving wheels, though the morning is frosty and the rails wet. Judicious driving and sanding save the situation. A blow on her whistle and she is in the long 35 chain tunnel, the exhaust flogging the brick arch and searching smoke everywhere. Out again, and round and upwards the big X roars, steaming well. At last the spiral motion ceases, and she rushes out upon a spur that carries the train over the long tunnel she has just passed through, 85 feet below, and then the line is straight in a 1 in 70 grade to Waimarino. After passing through magnificent forest scenery, and crossing the tall viaducts of Makatoke, Taonui and Hupawhenua, at 7.30 the train reaches Ohakune, half-way between Auckland and Wellington, where a welcome addition is made to the "personnel" of the train, in the form of a bulky 50-foot dining car that reeks of breakfast odours. Thereafter, as they career over the Karioi Plain, the passengers may sit at the cheerful tables and enjoy the glories of Mount Ruapehu, glowing and glittering in the morning sunlight. From Waiouru, the highest railway station in New Zealand, 2660 feet above sea level, the view of the mountain is superb, but eight miles further on, with surprising suddenness, the snow-clad vision disappears as the line dips and sweeps in a wide horseshoe to follow the valley of the Hautapu River to Taihape. At 9.33 the X engine, having given place to another of the A class, the train pulls out of Taihape. The way now lies towards the Rangitikei River, in which the Hautapu merges. Over the Mangaweka Viaduct and Makohine Viaduct—which took ten years to build—the wayfarers pass through scenery of dense white pine forests and high papa river banks, which mark where the Rangitikei rushes seaward. The whole effect is of a grey-green picture set in a frame of deepest blue, the blue of the summer morning skies. At Marton the line joins that from New Plymouth, and continues over undulating country to Palmerston North the great junction of the Wellington district railways. From this point radiate the lines to the Wairarapa, Napier, Foxton and Wellington.

Soon after midday, the Express, still hauled by the engine which was coupled on at Taihape, and which will cover the whole 161 miles between that place and Wellington, speeds away past Longburn Junction, where the old Manawatu Railway Company's line began. There is only one pause between Palmerston and Wellington, and the last 27 miles are heavy work for the men and the machine. With by little variation from the schedule time the Auckland express reaches Wellington, where through passengers and mails have several hours' wait, ere the night ferry leaves for Lyttelton.

When Maui, the Maori demigod, hauled the North Island from the ocean depths he would have conferred a boon on succeeding generations of white men if, instead of allowing his catch to settle and take root where it now is, he had played his fish and swung it round till it lay at right angles to the South Island, so that the two islands formed the letter T. Then the chief centres of population would have been within thirty-six hours' steam, at most, of one another.

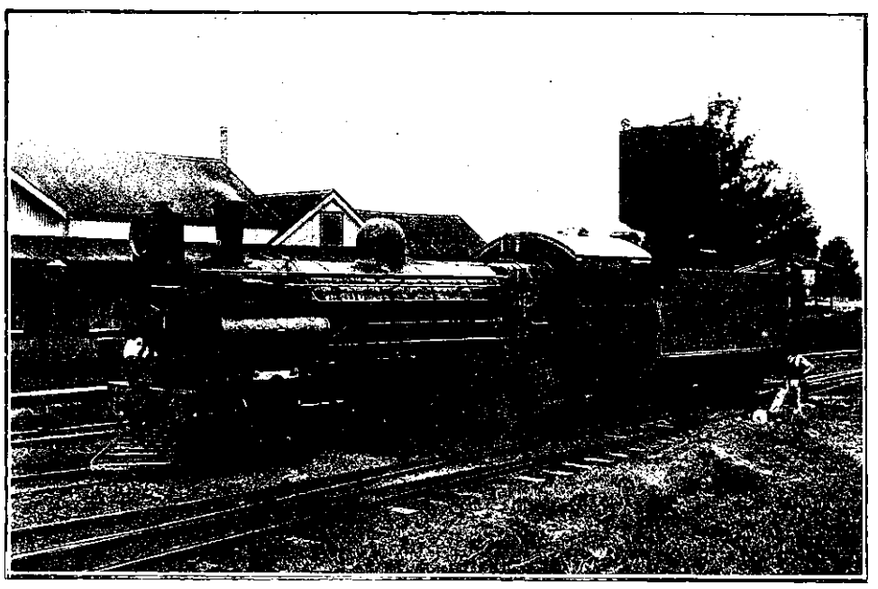
All unwittingly, Maui has caused the building of eight hundred miles of railway to connect Auckland in the north with Invercargill in the extreme south, and made it necessary that engines of speed and power should be built to carry the King's Mail careering over the railway as fast as steam and steel can drive it. The idea of making this thousand-mile link, of which 175 miles are by water, has long occupied the minds of progressive New Zealanders. Twenty years ago they dreamed of it. Twenty years ago our trains ran but slowly, our steamers took fifteen hours and more to cross the strip of blue. In 1898 the Government seriously contemplated the building of two fast steamers of three thousand tons to link the railway systems of the North and South. A committee was set up to take evidence from railway and shipping experts, relative to the establishment of a line of Government-owned steamers. Their evidence appears to have convinced the Government that such a service was in advance of the country's requirements. It is interesting to note, however, that Mr. T. Ronayne proposed a railway service which in practically every detail has been in operation for some years. His suggestion was that an express train leaving Dunedin at 8.30 a.m. should reach Lyttelton at 7.10 p.m. A steamer leaving Lyttelton at 7.45 would reach Wellington at 6.45 a.m., an eleven-hour trip, and connect with the 8 o'clock New Plymouth train. This is what is being done now, except that the journey from Dunedin occupies two hours less time, and the ferry steamer Maori often makes the run across the Straits in ten hours. Some time in the future, the route will be across the Straits to Picton, and thence by rail to Christchurch, Dunedin and Invercargill. With this end in view, in this article it is proposed to follow the suggested line.

The South Island Main Trunk Line.

In the early seventies there was much railway building and extension going on in Canterbury. The line to Dunedin was being built. Other suggested lines which loomed large were those with which it was hoped at an early date to connect Christchurch with Greymouth, Nelson and Blenheim. In another chapter the story of the West Coast line is told. Concerning the portions authorised for construction and those that are merely suggested is as follows:—From Picton to Ward, 50 miles, the line is completed and open for traffic; from Ward to Mirza 3¼ miles, construction is authorised, and money for a further 3¾ miles to carry the line through the Tar-barrel Hill and a mile beyond the Ure River is to be placed on the Estimates this year.

From Christchurch to the Bluff, and from Wellington to Auckland, the best that the country possesses in permanent way and rolling-stock carry the travellers to and fro, and there is a 175-mile sea-ferry journey to link the islands. On the Blenheim-Christchurch overland route there are 156 miles of travel that is old-fashioned in the extreme. Were the rails laid it would mean that the sea-ferry would have only a 50-mile journey—only two hours in open water.

If the last link was built it would be possible for a ferry steamer, such as the Maori, to leave Wellington at six o'clock p.m., two hours after the arrival of the Auckland train. She would reach Picton at nine and passengers boarding the train at once would reach Christchurch at seven the next morning. While the up train leaving Christchurch at eight would be in Picton at six in the morning. The returning ferry would reach Wellington at ten, giving two hours to through passengers who wished to do business in the capital. One fast steamer could do all the ferry work, and such a route will be a boon to travellers.



PACIFIC TYPE 10TH CLASS, CENTRAL AFRICAN RAILWAYS.
Weight of Engine, 74 tons 9 cwt.; weight of tender, 49 tons 5 cwt.; total weight, 113 tons 1 cwt.; tractive power, 26,000lb; size of driving wheel, 5ft. 2in.; steam pressure, 180lb.

other it will not be out of place to quote from the report in the proposed Christchurch-Blenheim line made by the late Mr. W. N. Blair, Government Civil Engineer in charge of South Island in 1875. He wrote:

"As this will be the main line connecting the two islands by means of a ferry from Picton to Wellington, I think considerable expense should be incurred to make the gradients such that a fair rate of speed may be maintained, otherwise there will be no inducement for through passengers or goods to take the rail instead of the sea from Lyttelton to Wellington."

The railway was then being built from Amberley to Red Post—now Culverden—and it is noteworthy that one proposed route for the West Coast line was to branch off here and go by way of Cannibal Gorge to Reefton. Many people still assert that this is the easiest route across. Had it been decided to build on this route, no doubt the railway to Blenheim would have had an impetus given to it by the neighbouring activities which by the adoption of the Arthur's Pass route are now proceeding at Otira Tunnel.

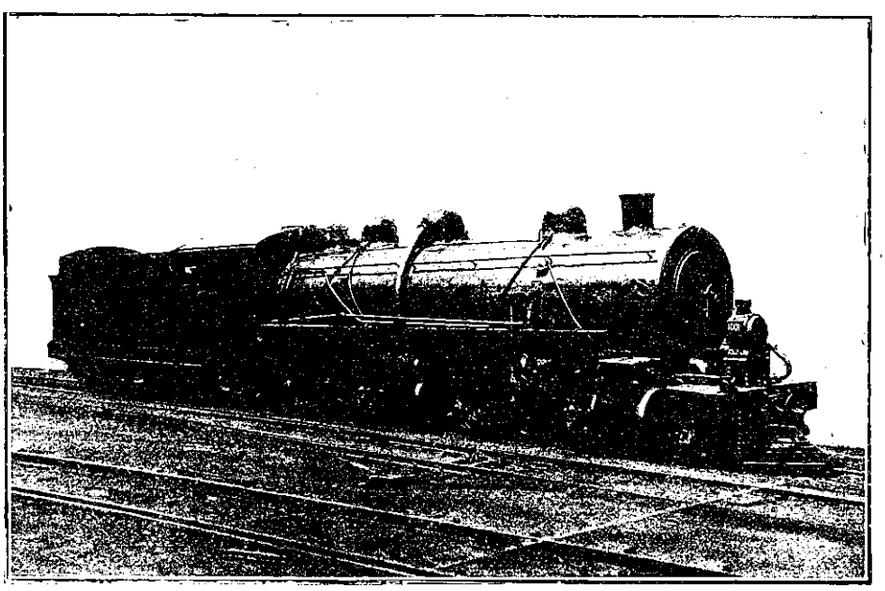
The way of the Blenheim line as first proposed was from Amberley to Jollie's Pass and on to Tophouse, where lines would branch off to Nelson and Blenheim. This inland mountainous route has now been abandoned in favour of the coastal route. The sentiments in Mr. Blair's report, however, apply equally well to the seaward lying line.

Since the inland route has from time to time been mentioned as the best route for a trunk line it may be stated that it attains a maximum elevation of 3300 feet as against 500 feet on the coastal line, and it is 30 miles longer than the latter route. What this elevation means in winter may be gauged by a comparison with the highest point in the North Island Main Trunk line at Waiuru, where the altitude is 2660 feet. The South Island line is 400 miles further south and 640 feet higher. It does not require the word of a traveller who has crossed the route in winter to prove how bitterly cold the temperature is. After a survey of this route, two lines were planned to go via the coast, one starting from Waiau township along what is now the coach road to Kaikoura, another from Waipara through the country where Cheviot now is and across the Waiau River. Thence by the line of the present coast road to Kaikoura. North of Kaikoura there was no doubt as to the route, as the only one available is that along the coast. The present position of the railway at the north end as regards the

The completed portion of the South Island Trunk Line, which has connected Christchurch and Invercargill for more than 30 years, was at first known in Canterbury at the Great Southern Railway. When the Christchurch-Dunedin section was first opened in 1878, the trains were, of course, small and primitive in equipment. But very soon the traffic became considerable, and rapid improvement had to be made to carry it promptly and economically. In the article dealing with express locomotives in New Zealand, it will be seen how the locomotive power and speed increased on this section. Up till six years ago only one passenger train ran each way between the cities of Christchurch and Dunedin, and there was no "right-through" service to Invercargill. Since that time, however, there have been two expresses each way, one of which traverses the distance between Christchurch and Invercargill, and connects with the Wellington Ferry, going and coming. Leaving Christchurch at 8 a.m., the passengers, which have reached Lyttelton in the steamer "Maori," travel right through to Invercargill, arriving there at 9.30 p.m., while the north-bound passenger leaves Invercargill at 6.15 a.m., and boards the ferry at Lyttelton at 8 o'clock in the evening. This service between the extremities of our Dominion is a very good one, and there are few countries in the world of the natural conformation of New Zealand in which a better service of 1000 miles length can be found.

THE WELLINGTON-MANAWATU RAILWAY.

There are still living in Wellington men who travelled by coach between Wellington and Palmerston North, before the days of the railway, and there are in this country a few old pioneers who walked the distance, and even greater distances, when there were no roads. Which goes to show how recent is the advent and how great the development of the railways in the short space of time. Originally the line called the Wellington-Manawatu line was surveyed and partly constructed by the Government, but the Government was very hard up, and, having already on its hands the building of the Wairarapa Railway, began to consider the advisability of carrying the latter line through the Manawatu Gorge to Palmerston and thus make one line instead of two. With this idea a Royal Commission was appointed to report on the prospects and actual necessity for the building of the Manawatu railway. And the Commission killed the project dead. They recommended that in their opinion the best route to Palmerston lay over the Rimutakas and through the Manawatu Gorge. These gentlemen were all friends of the Government, upon which fell the task of building the line and opponents of the former Ministry which had surveyed and begun the railway. It must, therefore, be concluded that their verdict was an inspired one. When it seemed likely that for a long time nothing would be done to bring the splendid timber and



MALLET TYPE—SOUTH AFRICAN RAILWAYS.
Weight of engine, 100 tons; weight of tender, 57 tons; total weight, 157 tons; tractive force, 48,100lb.

grazing country of the Manawatu into closer touch with Wellington, leading citizens called a public meeting to consider the advisability of forming a company to build the railway. In 1880 the Wellington-Manawatu Railway Company was formed, with a capital of £500,000, divided into 100,000 shares of £5 each. The provisional directors and officers were:– Sir W. Fox, Messrs. S. Brown, J. Bull, H. Bunny, J. Chew, H. Diver, J. Gear, E. Greenfield, A. W. F. Halcombe, W. Hutchison, C. B. Izard, W. H. Levin, J. Linton, J. Lockie, H. L. Logan, J. McKenzie, W. S. Moorhouse, J. E. Nathan, A. K. Newman, J. Plimmer, G. V. Shannon, B. Smith, J. S. M. Thompson, W. T. L. Travers, W. Turnbull, W. Whittan, H. C. Wilson, J. Wallace and A. Young; secretary, J. H. Wallace; treasurer, J. Woodward. The following year saw the Company successfully floated, and early in 1886 the line was opened from Wellington to Paekakariki. Later in that year, 36 miles from Longburn to Manakau were opened and the coach connection reduced to a run of 20 miles, and on 3rd Nov., 1886, the through rail service was opened. Only five locomotives were used to work the line. This the chairman attributed to the easy curves and grades ruling on the greater portion of the line, since he had been informed by English authorities that eighteen engines would be necessary to operate the 80 odd miles of line. Looking back, one cannot but suggest that the five locomotives must have been worked to death in struggling to maintain a very indifferent service. However, in 1888, two large American engines of the consolidation type, were imported to work between Wellington and Paekakariki. For purposes of economy, it was decided to burn wood instead of coal on the Longburn-Paekakariki section, and later this fuel was used on the hill section, with, however, very unhappy results when the load was heavy or the rails greasy. In the dry weather wood burning was discontinued for fear of setting the forests aflame. The line then ran through forests for a great distance, tall, virgin forests whose colonnades echoed and re-echoed the deep-toned, bell-like notes of the engine whistles.

Each year brought increased returns and further additions to the rolling stock of the company till with the dawning of the nineties the line had grown to be on level terms in point of speed and efficiency with the Christchurch-Dunedin express route. Up to this time the trains had been hauled for the most part by tank engines or light tender engines. The new locomotives were chiefly of American build, and one of these, No. 10 in the Company's numeration, a six-coupled 57-ton compound tender engine, with 4ft. 1in. wheels, has the reputation of having run at the highest speed yet attained on the railways of New Zealand. In the "Engineering News" of 26th January, 1893, the late Mr. Rous Martin tells of the trip, which was a trial one. He wrote: "For some little time it had appeared likely to become necessary, for special reasons, to run trains as rapidly as possible over the line, and an experiment was decided upon to decide what could actually be done in this way. The fastest train previously run had covered the 83½ miles in 2 hours 58 minutes running time, that is at 28 miles an hour, with a train of 150 tons. In this case it was resolved to try with only two cars, 25 tons in all, and to run at the highest velocity practicable. A good start was made from Wellington and a speed of 30 to 33 miles was made up the steep bank of 1 in 36 to 1 in 40 for five miles."

Mr. Rous Martin gave a timetable of the run from Otaki to Longburn, between which places the fastest running was made. To train-wearied travellers these figures will be refreshing, even though one realises that this was a "freak" performance. Here is the table:—

Distance.	Station.	Time.	Speed.
miles			(miles per hour)
—	Otaki (leave)	10·40½ a.m.	—
5·50	Manakau (pass)	10·50 ,,	36·6
9·15	Ohau (pass)	10·55 ,,	43·6
14·11	Levin (pass)	11·0½ ,,	54·5
17·98	Kereru (slack pass)	11·5⅔ ,,	43·2
22·42	Shannon (pass)	11·10⅔ ,,	53·4
25·79	Makerua (pass)	11·14 ,,	60·3
29·82	Tokomaru	11·18 ,,	60·5
33·36	Linton (slow over bridge)	11·21½ ,,	60·6
37·07	Longburn (arrive)	11·26¼ ,,	45·3

The driver of this engine was J. Fryer, and the fireman J. Taylor, now locomotive foreman at Paekakariki. On the engine were also Mr. J. E. Fulton, Mr. J. Marchbanks (now of Wellington Harbour Board), and Mr. Rous Martin. The above figures can therefore be taken as absolutely correct, and the performance was undoubtedly a marvellous one for the 3ft. 6in. gauge and 56lb. rails.

The W. & M. Company imported the first compound engines into New Zealand, their numbers 13 and 14, being Vauclain compounds. Number 13 was eight-coupled and worked between Wellington and Paekakariki, while No. 14 was six-coupled and ran on the level line to the northward. This engine on the 25th February 1896, hauled from Longburn to Paekakariki a train estimated to weight 432½ tons, the ruling grade being 1 in 100 on the straight. No. 17 an American compound consolidation, hauled, single-handed, 160 tons 16cwt. from Wellington to Johnsonville over a 1 in 36 grade, and No. 16, a somewhat similar type, brought a train of 320 tons from Paekakariki to Wellington. All these are Baldwin engines. When the Government Railways took the line over the Company had 20 locomotives, all of which were admirably adapted to the particular work allotted to them. Here are particulars of the Company's locomotives:—

Number		Type	Cylinder	Driving Wheels	Truck Wheels	Coal per Mile, in Lbs.	Oil per 100 Miles in Pts.	Tractive Force in Lbs.
3	8	Coupled Tank	17 x 20	43in.	6	68·1	5·9	†21,700
4	6	,, ,,	12 x 18	37in.	4	27·7	3·8	8,336
2	6	,, ,,	,,	37in.	4	29·5	3·5	8,336
4	6	,, ,,	,,	37in.	4	31·8	3·1	8,336
6	6	Coupled Simple Tender	15 x 24	44in.	4	48·1	4·1	10,928
7	6	,, ,,	,,	49in.	4	49·2	4·1	10,928
8	6	,, ,,	,,	49in.	4	51·0	4·0	10,928
9	6	,, ,,	,,	49in.	4	47·3	3·5	10,928
10	6	,, ,,	,,	49in.	4	48·2	3·8	10,928
19	6	,, ,,	16½ x 22	58in.	4	54·1	4·5	14,490
20	6	,, ,,	16½ x 22	58in.	4	55·1	4·4	14,490
5	6	Coupled Compound Tender	10½ 17 x 20	49in	4	46·8	4·8	12,571
18	6	,, ,,	,,	49in.	4	46·9	5·4	12,571
1	6	,, ,,	,,	49in.	4	48·2	4·3	11,538
15	6	,, ,,	,,	49in.	4	49·1	4·8	13,636
11	8	Coupled Simple Tender	16 x 20	43in.	2	64·0	4·4	16,670
12	8	,, ,,	,,	42in.	2	60·9	4·4	14,170
13	8	Coupled Compound	11 18 x 20	43in.	2	60·2	5·1	15,177
16	8	,, ,,	,,	43in.	2	68·4	5·0	16,240
17	8	,, ,,	11½ 18 x 20	43in.	4	60·7	5·6	17,677

Coal and oil, average over 8 years. †Estimated

No. 3 is accounted the most powerful tank engine, and No. 19 and 20 have the largest driving wheels in New Zealand, while No. 17 is a very fine consol. of 70 tons weight, and with an unusually wide fire-box. All the Company's rolling stock were, of course, taken over by the Government, and the locomotives renumbered, being included in the official list of engines.

A remarkable point in connection with the Wellington-Manawatu line is that, although it was abandoned by the Government because the line via the Gorge was preferable, the latter line was not completed and opened until ten years later, though Napier and Palmerston were linked up by rail in 1891. Palmerston enjoyed railway connection with Foxton and with Wanganui and New Plymouth before the Wellington-Manawatu Company was formed. In 1890 Mr. A. W. R. Fulton, for many years manager of the line, died, and was succeeded by his brother, Mr J. E. Fulton, who resigned in 1897. When Mr. J. H. Wallace, general manager of the line since its beginning, retired in 1894, Mr. J. H. Hannay succeeded him, and Mr. James Marchbanks became engineer to the Company in 1897.

On 7th December, 1908, the Wellington-Manawatu was taken over by the Government, the price paid for this important link in the North Island Main Trunk Line being £1,000,000. The unhappy Midland Company and this Company were the only private railway companies of any importance in New Zealand, and while the former essayed an impossible task, the latter affords an interesting example of what private enterprise can accomplish under Government supervision and in face of Government competition. In its length the Company's line traversed country of varying conformation, making it necessary to adopt special means for the economical working of the line. But for the knowledge that sooner or later the State would acquire the line, much greater development would have been made and increased services would have been run. As it was, the Wellington and Manawatu Railway Company served a useful purpose.

We subjoin a short financial history of the line, for which we are indebted to the "New Zealand Times":—

PROFITS AND DIVIDENDS.

It was not with a hope of securing prompt dividends that the Wellington and Manawatu line was promoted by the business men of Wellington. They were content first to benefit from the improvement in settlement and commerce which followed its opening, but in 1891 it commenced to pay, and the shares, which could have been bought at five shillings discount, went up to par. In 1901 the price of £1 shares had risen to 30s., at which figure the late Mr. Seddon wished to acquire the shareholders' interests. A steady run of seven per cent. dividends has considerably hardened the price, and original investors were able, before the Government acquired the line, to get in the open market about £2 5s. for their well-placed sovereign. The following table indicates the net profits of the Company and their main sources since its inception.—

Year.		Land.	Railway.	Dividend.
			£	Per cent.
1890	... Balance	16,000	2,136	nil.
1891	... Profit.	3,177	1,161	3½
1892	... ,,	3,270	7,967	5
1893	... ,,	3,672	7,258	5
1894	... ,,	3,420	8,497	6
1895	... ,,	1,962	8,301	6
1896	... ,,	2,115	8,916	6
1897	... ,,	1,754	8,954	6
1898	... ,,	1,910	8,339	5
1899	... ,,	1,964	6,544	5
1900	... ,,	2,499	8,600	5
1901	... ,,	2,576	9,791	6
1902	... ,,	2,710	9,072	6
1903	... ,,	4,308	10,361	6 & 2s. bonus
1904	... ,,	5,177	11,065	7
1905	... ,,	5,184	10,389	7
1906	... ,,	5,700	11,264	7
1907	... ,,	6,682	11,446	7
Land account		...	...	£74,392
Railway account		...	...	153,064
Total net profit		...	...	£227,456

THE WELLINGTON-WAIRARAPA LINE.

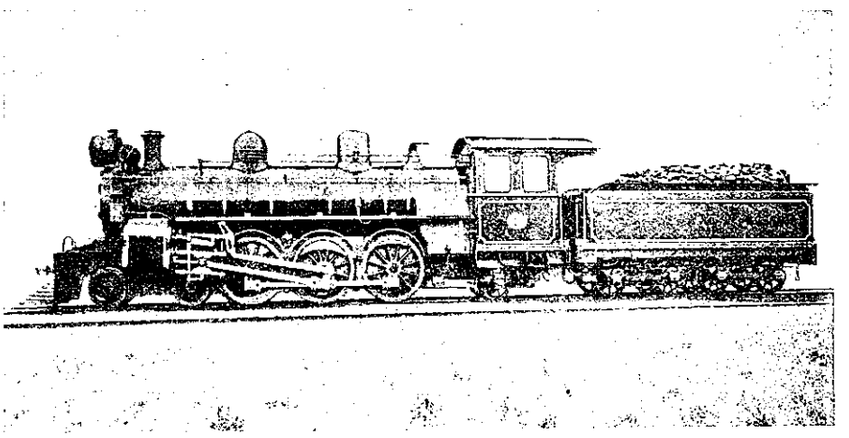
The Rimutaka Hill.

If there be anything in omens, then this section of railway was fore-doomed to the reputation it has for causing controversy regarding the route it follows and the one it should have followed and should be diverted to. For on the day of the turning of the first sod at Pipitea Point there was such an engagement of fisticuffs as has never been witnessed since in Wellington. The army of navvies whom the contractors, Brogden and Sons, imported for the work, and the blue-jackets from a man-o'-war were gathered at the ceremony, and immediately afterwards engaged in a terrific battle on the beach and flat land about the Point. It raged all the afternoon and into the evening, and many a sore head and bruised skin and aching body were given and got. That was forty years ago. Men have been wrangling about the Rimutaka Incline ever since.

The Rimutaka Incline, a short part of the line scarce three miles long, is the only remaining incline in the world worked on the Fell system by Fell locomotives. When the line was built it was confidently but quite erroneously supposed by its promoters that it would be the main thoroughfare between the capital and Palmerston North, Napier New Plymouth, and other northern towns. But the Manawatu Railway reached Palmerston long before the Wairarapa line did, and the Napier and New Plymouth expresses travelled by that shorter and easier route, as they do to-day. Because of the rivalry of the Company and the Government, when the Wairarapa line reached Woodville, the Napier express was made to run via the Wairarapa, as were many goods trains, and this threw some heavy work upon the locomotives which operate the incline, for it requires two or three engines to bring a train up the hill, and in busy times the line was frequently working day and night; as it was impossible to procure any more Fell engines the railway engineers built a compound Mallet engine, which assisted the Fell engines, though even then the task was almost beyond their power. The average grade is 1 in 15, and some of the curves are of great severity. A third steel rail is laid between the usual rails, and upon this the special grip-wheels of the Fell engines work. These wheels have level edges and are pressed by screws and levers on the sides of the steel rail. When caused to revolve by powerful machinery the wheels haul the train up the hill, being assisted by the ordinary driving wheels. The effort made by the engines is tremendous, the noise terrific, two distinct exhausts from separate engines exploding into the one funnel, and bellowing and roaring

into the quiet atmosphere. At night the sight is weird, and in the tunnels at any time the smoke is dreadful. As an experience, the trip is well worth the making. But it seems strange that men could ever have approved this as a main line route to the north when others offered.

Now that the Government has taken over the Manawatu line, all expresses and most goods traffic go by that route; only the South Wairarapa traffic crosses the "Hill of Purgatory," the existence of which is, without doubt, a serious bar to the progress and development of the Wairarapa Valley. There are at least two other routes by which the ranges could be crossed, but, of course, the construction of such a deviation would be costly. It is, however, bound to come, for the limit of what the Manawatu line can carry on a single track will soon be reached. It will probably then be advisable to build the deviation. With the "Auckland-Wellington via East Coast" route an accomplished fact the Wairarapa will doubtless be given a well graded line to Wellington, for there will be a great trade some day between the capital and all the East Coast.



CLASS "A" LOCOMOTIVE, N.Z.R.

4-Cylinder balanced compound; 6 coupled 4ft. 6in. driving wheels; weight 72 tons; engine 47 tons, tender 25 tons; tractive force, 17,150lb.

EXPRESS ENGINES OF NEW ZEALAND.

The impression many travellers receive of slowness in New Zealand trains is caused by the long waits at stations—even the Main Trunk express is delayed so. In actual running, 45 and 50 miles an hour are speeds that are the rule, not the exception, on favourable roads. It would be madness to race on tortuous mountain roads. Safety and commonsense forbid it. But our express engines could do it—with reasonable loads, that is, say, six modern carriages. In England and America, where the speed records are made, very few expresses exceed that length. New Zealand about holds the record for length of passenger trains. The history of express engine running in New Zealand is not a tedious one. It is very short, speed on our railways being of such recent dates. In 1878 the line between Christchurch and Dunedin was opened and very soon a large traffic grew on this route. Here the most rapid advance in locomotive power was made. The first tender engines—the J class—were of English make, but resembled the American design in having a Mogul wheel base. They were six-coupled with 3ft. 6in. driving wheels. When it was found necessary to run expresses between Christchurch and Dunedin, eight locomotives were brought from the Rogers Locomotive Works in America. These constituted class K on the New Zealand railways, and were fast with light loads of 70 tons or so, a speed of 30 miles an hour being consistently achieved. They had four-coupled driving wheels of 4ft. diameter, and cylinders 12in. x 20in. The late Mr. Rous Martin, a railway writer of note who graduated in New Zealand, stated that with larger boilers and cylinders the K engines would have done much better with heavier loads. These engines are still running on light suburban and branch line trains, and railway men regard them as speedy, all things considered. When the loads were increased it was found necessary to "double-head," that is, attach two K engines to a train of 12 cars from Christchurch to Oamaru, and to reduce their load to 8 cars on the hills between Oamaru and Dunedin, where the grades are 1 in 50.

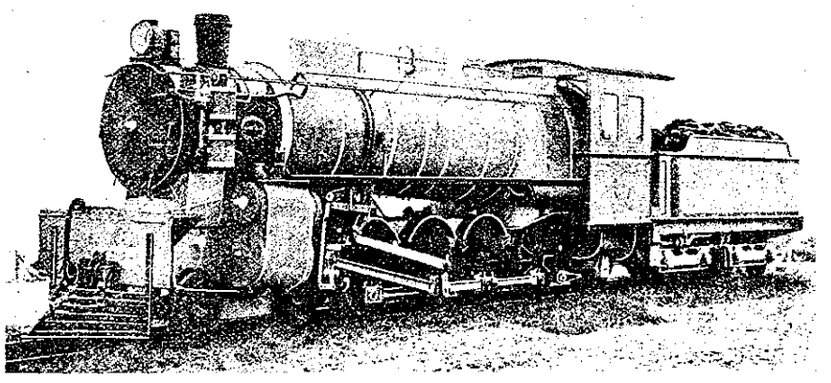
This proved too expensive, so designs were prepared for ten express engines with six-coupled 4ft. driving wheels, 15in. cylinders, and bigger boilers. These were the first of the V class. The order was sent to England, and after a long delay 2 engines were delivered and advice sent to say that in order to carry out the requirements ten tons weight had been added. This was a serious matter, as the railway and its bridges were not competent to carry the extra weight. Much correspondence ensued, and the builders finally allowed a sum to help cover the cost of strengthening the bridges. Then an order was sent to the Baldwin Locomotive Works for six express engines and six "consolidation" freight engines. The difference between English and American methods was manifest. The 12 engines were shipped within 5 months from the date of the order leaving New Zealand; they were of the specified weight, and proved satisfactory. These were the class N (express engines) and O (freight). Mr. Rous Martin, who strongly favoured the American engine for our railways, made the following comparison to show the cost of running these engines and the English V and P types (details of oil, tallow, waste, etc., are not shown):—

Class.	Miles run.	Fuel in pence.	Repairs.	Total cost per mile.
	EXPRESS ENGINES.			
American N	21600	3·13	2·9	8·22
English V	19406	2·62	3·44	8·90
	FREIGHT ENGINES.			
American O	16600	3·10	2·81	9·65
English P	13300	3·39	3·28	10·28

The comparison is not quite a fair one, as the English engines worked on the Oamaru-Dunedin grades at a speed of 20 to 25 miles an hour, while the Americans ran between Oamaru and Christchurch at a speed of 35 miles an hour. It is, however, noteworthy that the American's repair bills were far less than those of the English machines.

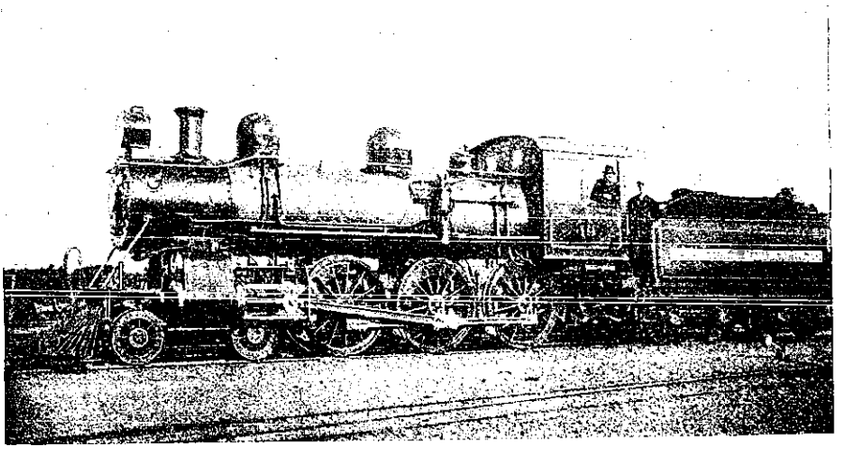
The next step in the advance was the U engine; a good deal heavier than previous express engines. This type is six-coupled. Ten of them were built in America, six in England, while eight were built in New Zealand. The imported engines had 4ft. 1in. driving wheels, and the locally built one 4ft. 6in. wheels. There are now 49 U locomotives on the New Zealand railways, 47 of which run on the Hurunui-Bluff section, while 2 are employed on the Wellington-Palmerston North line. In 1901 a good deal of discussion was raised as to the relative merits of the English and American locomotives, and extended tests were carried out with a view to coming to some conclusion concerning which it would be most advisable to import. The balance swung in favour of the American, and in the following year 13 Q engines were imported, ten being for use in the Hurunui-Bluff and 3 for the Auckland sections.

The Q is a six coupled engine of 65 tons weight, with driving wheels 4ft. 1in. in diameter. They were able to cope more successfully with the heavy 12-car trains than the U engines, and are still employed on express work. At holiday time, when the trains stretched out to from 16 to 20 cars, the Q made good time, single-handed, from Christchurch to Oamaru, and double-headed from there to Dunedin.



CLASS "X" LOCOMOTIVE, N.Z.R.

4-Cylinder balanced compound; 8 coupled 3ft. 9in. driving wheels; weight of engine 61 tons, tender 28 tons; total, 92 tons; weight on drivers, 50 tons; tractive force, 30,000lb.

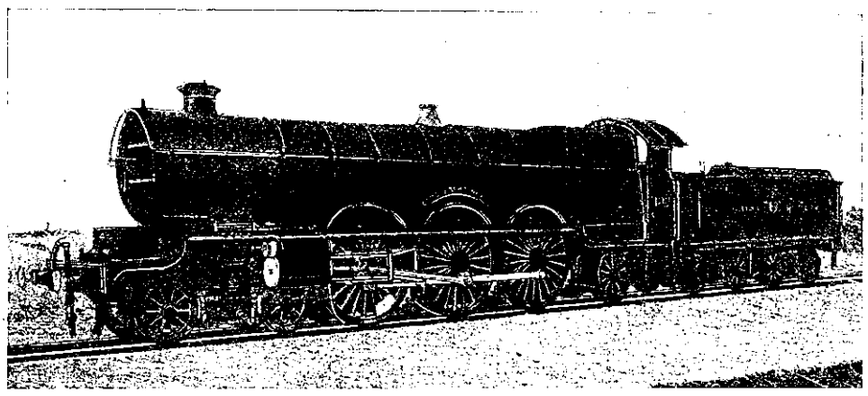


ENGINE NO. 464, CLASS "UD" (Formerly No. 19, Wellington-Manawatu Co.).

This engine and her sister No. 465 have the largest driving wheels in New Zealand.

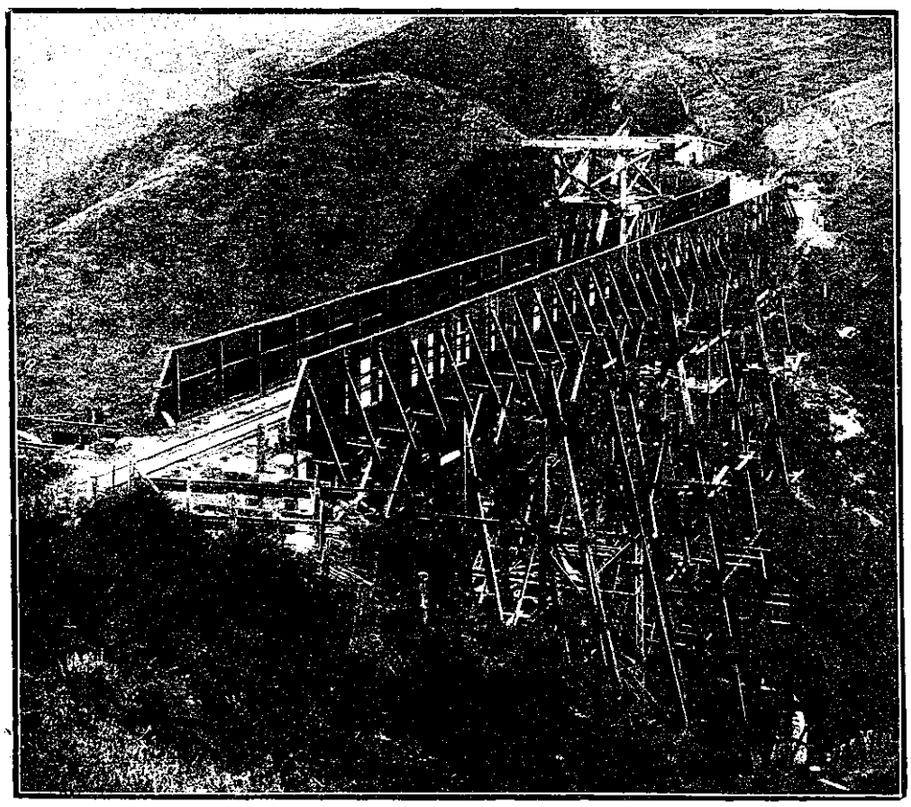
In 1904 the New Zealand Government decided to import no more engines for the railways. In future they were to be built, and the design which Mr. A. L. Beattie, Chief Mechanical Engineer, chose for his express engines was the balanced compound, an adaptation of the French pattern. The result is the A engine, of 72 tons weight, six-coupled, 4ft. 6in. drivers and a tractive force of 17,400lbs. The high pressure cylinders work on the inside cranks, and the low pressure on the outside. The pioneer of this type (No. 71) ran on the Christchurch-Oamaru line, and at first there was a storm of criticism levelled at her. But the engine, and others of her kind, have outlived the storm, and are doing good work on the expresses. From the enginemen's point of view, they are not so easy to understand as other types, but once mastered they are as easy to run. At present there are about 30 in use, and more are being built. By courtesy of Mr. A. L. Beattie, the writer on one occasion travelled on No. 71 from Christchurch to Ashburton; the speed reached 51 miles an hour, and never fell below 40 when clear of stations. The A is undoubtedly a fine engine, and has become the standard express engine of our railways.

The last addition to the engine list is the X locomotive. Six of these engines, which are of 92 tons weight, with 8-coupled 3ft. 9in. driving wheels, are in use on the 90-mile stretch between Taihape and Taumaranui. The tractive force of the X class is 30,000—that is the pull she exerts on the drawbar of the train. She is able to manage, single-handed, the ordinary train of nine cars—about 250 tons—on the 1 in 50 grades, but with holiday traffic or in greasy weather, sometimes two are employed. It may appear to some observers that in New Zealand we are approaching the limit of weight and size of engine and vehicle which can be carried on a narrow gauge system. But this is not so. One has only to turn to the South African railways, which are of the same gauge as our own, to see what can be carried.



THE "GREAT BEAR"—LARGEST BRITISH LOCOMOTIVE.
Diameter of driving wheels 6ft. 8½in.; cylinder 15in.; stroke 26in.; weight of engine and tender 143 tons.

must be mentioned that on these large engines the white driver and firemen are assisted by a native fireman, the task of shovelling coal into the monster fires being too great for one man. It is not suggested that our engines are too small. The African examples are quoted to show what may be done when our bridges and tracks are strengthened, tunnels enlarged and station clearances increased. The South African systems also set an example in "scrapping" obsolete and obsolescent engines. In one year about 70 engines were scrapped in the Central System. The New Zealand engine list is loaded with a lot of old-fashioned machines which use the same amount of coal, etc., as a modern engine would use. This, however, is a matter of railway policy and management on which only experts can express an opinion. The vital point remains that a great many more modern engines are required.



REBUILDING BELMONT VIADUCT.—MANAWATU LINE.
The wooden viaduct was replaced by a steel one, which was built inside the old one without interfering with running of trains, under the direction of Mr. J. Marchbanks, Engineer, Wellington and Manawatu Railway Company.

There the express type is the tenth class engine, of 107 tons weight, and 24,730lbs. tractive force, freight trains are hauled by the eleventh class of 113 tons weight and 34,667lbs. tractive force. These are English built engines. In 1909 an American-built Pacific type engine was added to the tenth class. She is of 113 tons weight. And another experiment is an American-built Mallet compound of 157 tons weight. (Note that these weights are English tons.) This locomotive has hauled 1000 tons dead weight on the level at a considerable speed. It

GOVERNMENT CONTROL OF RAILWAYS.

And an Offer from Private Enterprise.

Although at the present time practically all the railways in New Zealand are operated by the Government, in the early days private enterprise was not slow to offer to build and run our railways.

Up to the year 1871, all railway surveys and constructions were carried out by the Provincial Governments. But in that year a movement was made by the General Government to take over existing lines and survey and build new ones. Only the Canterbury and Southland systems were in working order then; the Bluff-Invercargill, and a short line to the westward, and the Christchurch-Lyttelton, Christchurch-Selwyn and Christchurch-Rangiora lines.

At Wellington and Auckland, preparations were being made to build railways to Masterton and the Waikato respectively. Napier was planning a line to connect her with Palmerston, and from that town to Foxton in one direction, and to New Plymouth in the other, a railway was surveyed. The Foxton-Palmerston North line was, in fact, the first line in the North Island to be opened, and it was laid with wooden rails.

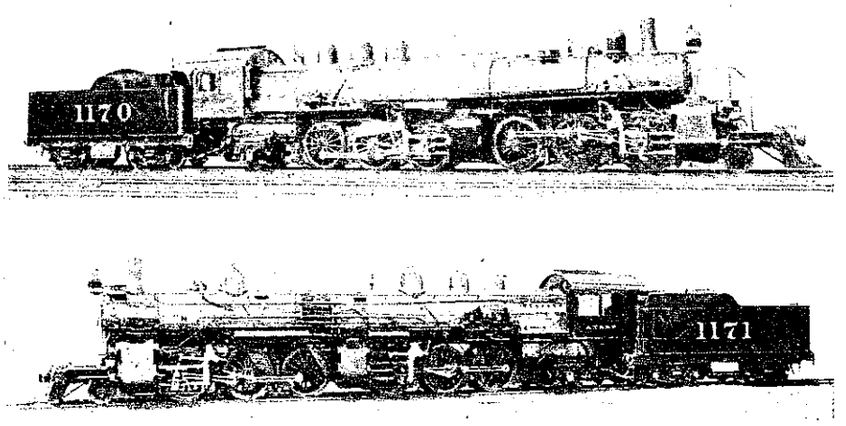
In the midst of all this railway activity, the General Government received a unique offer from one Captain Audley Coote, representing English capitalists who were interested in railway construction in England and were looking for colonial investments of a like nature. It was proposed to form a company to be called the Grand Trunk Railway Company of New Zealand, with a capital of from £2,000,000 to £2,500,000, for the purpose of building railways in New Zealand. The idea was for the Government to guarantee 5½ per cent. on all the capital the company invested in railway construction in New Zealand. When the lines were finished the company was to have the running of them for a period of 35 years and during that time all profits "over 7 per cent." were to be divided between the Government and the Company. What was to happen at the end of the period does not seem to have been gone into; the Government did not entertain the proposal for long, preferring to build its own lines with borrowed capital. The capitalists mentioned secured similar rights in Tasmania and doubtless found their enterprise, if not profitable, at least safe.

Having made its decision, the Government set about the work of building and of taking over the existing lines. This latter appears to have been finally accomplished in 1873, yet as far as Wellington was concerned, when the Wellington-Hutt line was nearing completion, the Minister of Public Works, the Hon. E. Richardson, early in 1873 wrote to the Superintendent of the Province advising him that the line would be ready by 1st February, 1874, and asking for information as to whether the Superintendent had arranged for a railway staff. Later in the year the Minister wrote again, reminding the Province that he had heard nothing as to the organisation of the staff and desiring information as he had numerous applications for appointment and did not know how to treat them. However, the line was not ready by the time stated by the contractors, Messrs. Brogden & Sons. And it never appears to have been controlled by the Provincial Government. It may, therefore, be taken with accuracy that after 1874 all railway systems in New Zealand were controlled by the Minister of Public Works under the General Government. Then came the Railway Commissioners era, which was followed by the present administration through the Railway Department.

It has been argued that it would have been better to have altered all the existing lines to the standard gauge of 4ft. 8½in. when the General Government took them over. Doubtless it would have been. Yet the present gauge is capable of much greater things than have been attempted in New Zealand, and had the early administrators of the narrow gauge system been more generous in their ideas, much of the

present trouble due to clearance limitations would have been avoided. Tunnels were made so small, in many cases, that a long 50-foot car cannot negotiate a curve in them without becoming jammed against the brickwork of the tunnel. Similarly, station platforms have been built with so little clearance that the large express train carriages now running actually overhang the platforms. In the case of locomotives, they have to be built to such measurements, as will clear the station platforms and also the overhanging station roofs. To alter all these will be costly, but some day it will have to be done, for the growth of traffic and the correspondent enlargement of all rolling stock must go on. It is only necessary to look at the South African railways to see what size of trains and weight of loads can be carried on a 3ft. 6in. road. This gauge will serve New Zealand for all time—with heavier rails, a greater number of fast and powerful locomotives and double tracks where the trade demands it, a first-class service can be run. Another step in the right direction is the reduction of excessive grades now being undertaken. Meanwhile it is well to remember that most of the disabilities under which our railways labour are the result of the reaction against the broad gauge of Canterbury which found expression in the narrowing of the whole scheme of railways in New Zealand to an extent that made them little more than toys.

From the New Zealand Railways Statement for 1910, the latest published, it appears that there are now 2717 miles of road open for traffic. The net revenue (£1,080,316) exceeded that of the previous year by 265,605, and was equal to a return of 3.58 on the total capital (£30,321,191) invested in opened and unopened lines. In the General Traffic Maintenance and Locomotive Departments a total number of over 12,000 men and boys are employed, and the rolling stock consists of some 500 locomotives, 1200 carriages, including 8 sleeping cars, 400 vans and mail vans, and 16,000 waggons. On all main lines and many branches the tablet system of train control is in vogue, interlocking points and signals are fitted at important stations, and the Westinghouse air brake was fitted to the major portion of the rolling stock some years ago at a cost of £250,000. Taken all in all, it may be said that the New Zealand Railways are advancing in point of equipment and quality of service.



MAMMOTH AMERICANS: 500 TON MALLET TYPE ENGINE.

A Smoke(d) Theorist.

It was on the Mihiwaka Hill, just above Port Chalmers, where the main line passes through several tunnels. The occupants of a certain compartment of a "bird-cage" carriage were an English tourist and his wife, a young New Zealander and his girl, and myself. When the gasping, smoking engines yelped a warning I rose to close the window, but the Englishman interposed.

"Excuse me," he said! "if we leave the window open on one side and the door on the other, the atmospheric pressure will be balanced. No smoke or steam will enter, and we shall be spared the suffocating effect of closed windows and doors. I have tried it many times."

The idea sounded feasible, and was undoubtedly a brave one—in Mihiwaka Tunnel—so we acquiesced. Into the tunnel the engines roared. Presently a cloud of steam enveloped the train, and for an instant none entered the compartment.

"There you are," exclaimed the smoke theorist in triumph. But it was only for an instant. The steam—thank heaven there was no smoke—rushed down the corridor and in through the door.

"All right," cried the theorist reassuringly, "it will all go out of the window." And as people do when a born leader appears, we acquiesced.

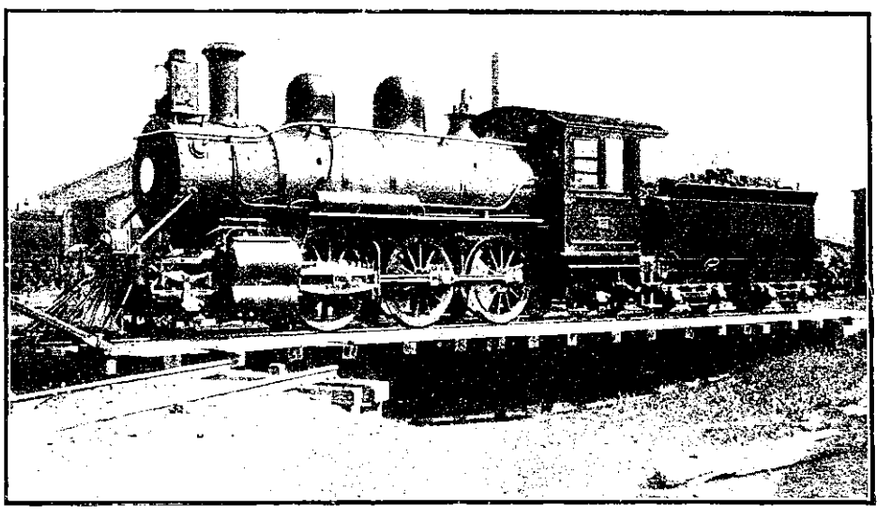
About this time we lost sight of one another. The New Zealander's girl began to cough and the tourist's wife said, "Is it safe, Harry?"

What reply he would have dared to make we never knew, for the fireman began to coal up, and beautiful black smoke began to oust the steam. As one man, the other New Zealander and myself slammed the door and the window and sank back in our seats with perhaps a shade of shame in our hearts in thus surrendering before the Englishman. In righteous indignation he made our cowardice clear.

"By heaven, gentlemen," he said, "what have you done! Why, you've shut it all in!"

An Eccentric Incident.

Number Eleven was bringing the southbound New Plymouth-Wellington express from Paekakariki to Wellington on a certain Saturday evening many summers ago. It was a heavy train, every car filled with people, many of whom were to catch the South boat, which sailed at eight o'clock. About a mile south of Porirua the speed of the train decreased, and after a few spasmodic jerks we came to a standstill. No. 11 had disgraced herself. She had slipped an eccentric. Her driver was



SWINGING ENGINE ON TURNTABLE.

down among her "internals" and presently reappeared.

"No good, have to get to Tawa Flat somehow."

The powerful engine, crippled as she was, started the train jerkily, only one side of her machinery being of use. By dint of patient and careful driving she made Tawa Flat. When she came to a standstill a dozen passengers crowded round to hear what was wrong. But there was no one to answer questions till the fireman came to the surface to get a spanner or something.

"An eccentric's gone," he said briefly. "We're going to leave half of the train here."

"Which half?" eager voices asked, every man ready to run with his bags to the favoured half. The fireman was too hot and busy, and he was under the engine again. The guard came out of the telephone room of the flag station and said, "No need to worry. We'll only be half an hour late, gentlemen."

"What about the South boat?"

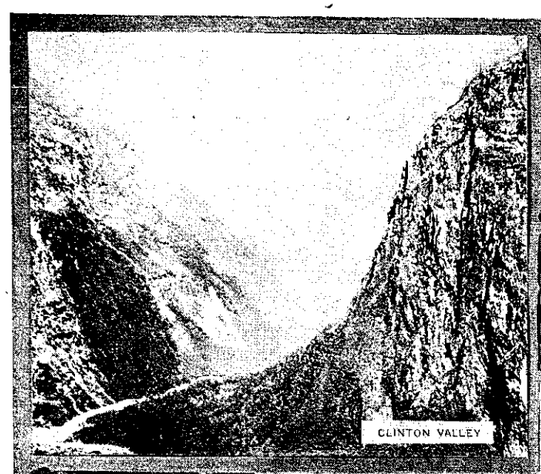
"They're telephoning to keep her back. Now we're going to drop the dining car and the three cars in front of it, so kindly take your bags out of these cars."

For a quarter of an hour there was hustle. Then, haltingly, like a lame giant, No. 11 pushed the four cars into the siding, and came slowly back to the train.

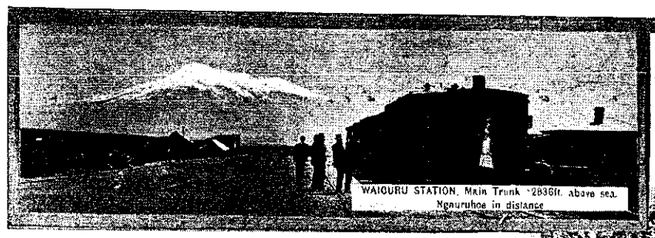
"Good 'orse," said a sporting man; "Give 'er some oats."

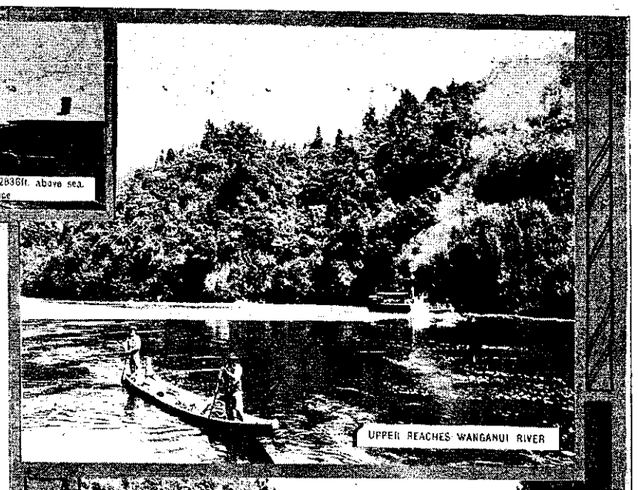
Bl-r-r-r-r!! Her whistle rang out, the train moved, nearly stopped while the enginemen's prayers shoved her over the dead centres, where the steam could not help her. On, on, on, in funny jumps that made the strap-hangers in the crowded cars tumble against one another. Quicker, quicker, her throttle was opening now, and she left the level and took the long grade to Johnsonville at a ten-mile speed. Only a splendid machine splendidly handled could perform such a task. Johnsonville was reached 35 minutes behind schedule time. The rest was easy, and five minutes were picked up on the downhill run to Wellington.

With a few minutes to spare the Southern passengers took cabs and raced for the wharf, where was enacted the last sad act in the eccentric incident. Somehow or other the message to delay the vessel has miscarried. The "Rotomahana" was backing away. Twenty feet of water, widening every minute, separated the travellers from their snug berths. They shouted, almost cried, to the Captain to come back. He could not hear, did not know there was aught amiss. The last note was struck by a large man who cried, "Hi! Captain, it's me, Bill Smith. Come back!" The "Rotomahana's" telegraph rang "Full Speed! . . .!



THE NEW ZEALAND RAILWAYS





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Issued daily (Sundays excepted) throughout the year, as under—

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(b) Available over NORTH ISLAND lines for FOUR WEEKS from date of issue £6

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These tickets are available over Government lines only, and are obtainable as follows—(a) and (b) at Auckland, Onehunga, Rotorua, Hamilton, Frankton Junction, Thames, Napier, Hastings, Woodville, Masterton, Palmerston North, Wanganui, Hawera, New Plymouth, Wellington and Te Aro; (a) and (c) at Nelson, Greymouth, Lyttelton, Christchurch, Ashburton, Timaru, Oamaru, Palmerston, Port Chalmers, Dunedin, Mosgiel, Alexandra, Clyde, Milton, Lawrence, Clinton, Invercargill, and Bluff Railway Stations; (a) and (c) series are available for travel over Lake Wakatipu.

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To Kingston, Lake Wakatipu

(Including Saloon Steamer Passage Kingston to Queenstown and back)

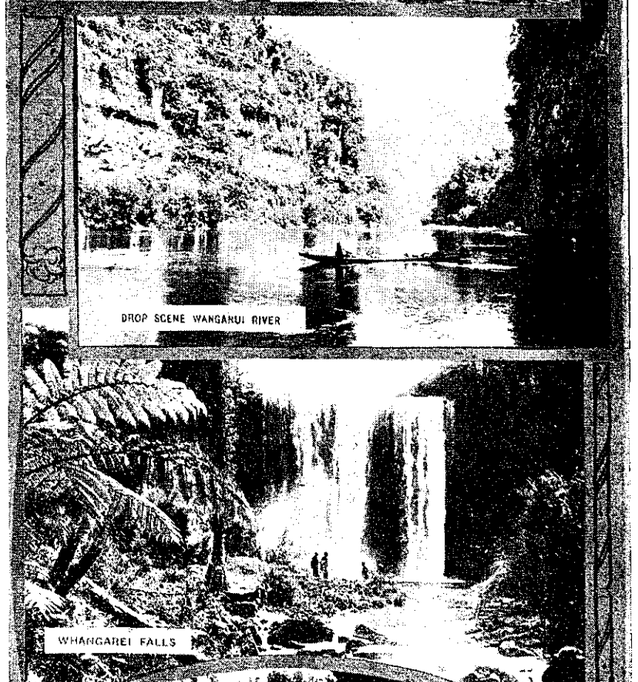
From—	1st Class £ s. d.	2nd Class £ s. d.
CHRISTCHURCH (*via* Waimea Line only)	4 12 0	3 7 6
CHRISTCHURCH (round trip *via* Waimea Line or Invercargill)	5 7 6	3 15 0
DUNEDIN (*via* Waimea Line only)	2 5 0	1 13 6
DUNEDIN (round trip *via* Waimea Line or Invercargill)	2 12 6	2 0 0
INVERCARGILL (*via* Kingston Line only)	1 6 6	1 0 0
INVERCARGILL (*via* either Kingston or Gore and Waimea Line)	1 12 6	1 3 6

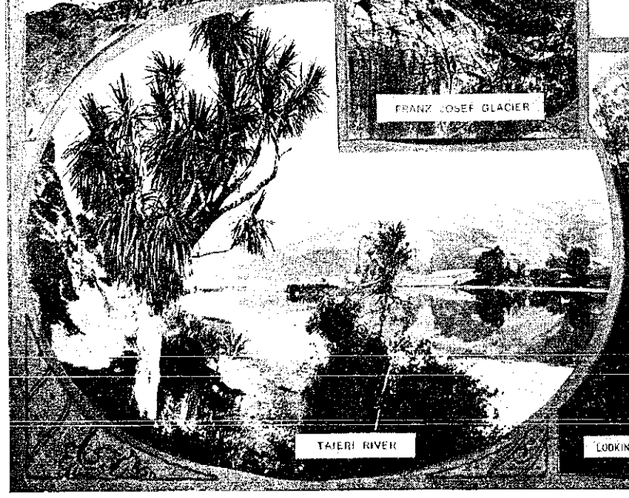
To Pembroke, Lake Wanaka

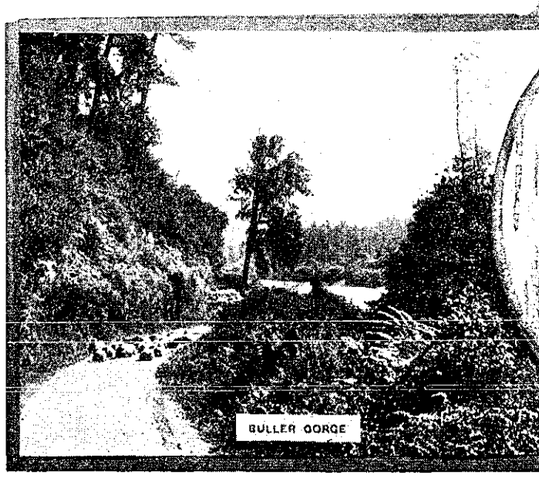
(Including Saloon Steamer Passage, Kingston to Queenstown and back, and Coach, Queenstown to Pembroke and back).

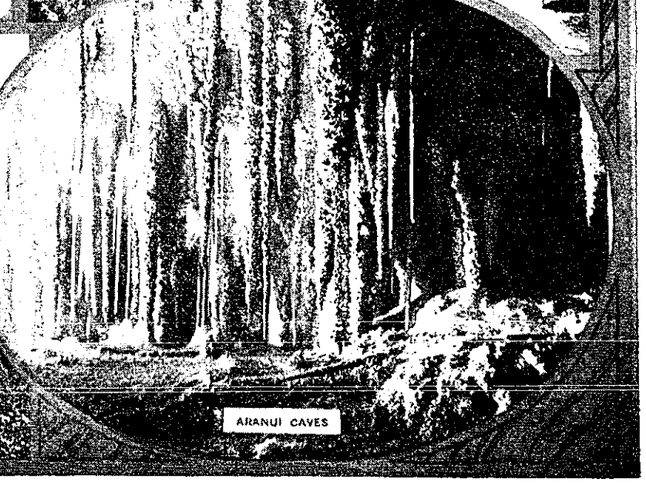
From Dunedin (*via* Waimea Line only) ..... 67/6 (First Class).

The journey may be broken at any station at which the train is timed to stop after travelling twenty-five miles from the original starting-station, provided the specified time for which the tickets are available is not exceeded.









Miscellaneous.

Picture-Frame Outfit.

A device for holding the moulding while nailing and gluing which is practical can be easily made. The clamps can be secured from the top of two old clothes wringers by sawing three inches on either side of the screws. The base of the device should be a 2in. hardwood plank about 18 x 22 inches. A board 6 x 8 and ½ inch thick should be glued and screwed to the base. Bolt the clamps to the base, leaving sufficient space between the ends of the screws and the holding board to place the widest mould which one would use for any frame. This space must not be too wide, for the screw has a tendency to spring up when heavy pressure is applied. Small blocks are to be used when narrow moulding is being held, or on any moulding which the end of the screw would dent. The difficulty in making frames is in holding the pieces firmly together while nailing. With a little practice as good a joint can be made on this machine as with a bought device, if one has a true mitre box.

An Electroscope Made of a Board and An Old Walking Stick.

A sensitive electroscope, with which the elementary laws of electrical attraction and repulsion can be satisfactorily demonstrated, may be made very easily of the commonest materials, with practically no expense. The materials and the mode of construction may be varied indefinitely. The following simple and interesting method is suggested by a writer in "Die Gartenlaube":

The stand of the electroscope is constructed by driving the end of an old walking stick tightly into a hole bored for the purpose in the centre of a square piece of board, to the under surface of which three small blocks of wood have been glued or tacked to serve as feet, so that the combined board and cane will stand firmly on the table, with the cane vertical. Most articles of furniture have four feet, and this is the reason why they do not stand firmly. Scientific instruments are always mounted on three feet. A fibre of unspun silk is tied at its middle about one end of a light wooden rod, say twelve inches long. The silk fibre is then stretched tightly between the nails driven into the can and its ends are tied to the nails. The upper nail is connected with the free end of the rod by a second fibre of such length that the rod is supported in a horizontal position.

The free end of the rod must now be furnished with a very light ball or knob. Two natural vegetable products are singularly well adapted for this purpose. One is the oak gall, the other the fungus called the puff ball, which abounds in the woods in many districts. The puff ball is filled with a fine yellow powder which is scattered by the slightest pressure. This powder must not be allowed to enter the eyes, for it may cause severe inflammation. A puff ball of the size of a small apple is impaled on the end of the wooden rod and is painted with gold bronze, not for ornament, but to give the ball a surface that will conduct electricity. The cost of the gold bronze (a few cents) is the only expense which has been incurred in constructing the electroscope, which is now complete. We will begin our experiments by rubbing a glass tube or bottle vigorously on the coat sleeve or with a woollen cloth and thus electrifying it, and holding it near the gilded puff ball. The ball immediately moves toward the glass by swinging the horizontal arm round its axis, the vertical silk fibre. This experiment shows that glass, electrified by rubbing with a woollen cloth, attracts an unelectrified body, the gilt ball. If a hard rubber penholder is rubbed in the same way and brought near the ball, precisely the same result will follow.

Correspondence.

(To the Editor.)

Milton, July 23, 1911.

In his notes on weight, Mr. Peter Ellis informs us that unless a body is free to move, or in the act of moving, it has no real weight. If he had used the terms inertia or momentum in place of weight he would have been correct. Newton showed that every particle of matter attracts every other particle of matter, and this force of attraction is called gravitation. "The weight of a body is simply a measure of the mutual attraction between the body and the earth." and for convenience all English speaking people use the same terms or tables. The mutual attraction between two bodies, whether close together or at an infinite distance apart, is always directly proportional to their masses and inversely proportional to the square of their distances. A body 4000 thousand miles above the surface of the earth will only weigh one-fourth as much as it would on the surface, which is 4000 miles from the centre. A body which weighed a ton on the earth would, if weighed with a spring balance on the planet Mars, only weigh, roughly speaking, half a ton, because Mars has only about half of the mass of the earth. If the masses of two bodies are known, their pull on each other can always be found, however far apart they are by dividing the sum of their masses by the square of the distance between their centres. Mr. Ellis further says: The earth, taken as a whole, can have no real weight except in the direction of its orbit, unless it is drawn by influence outside or inside or above or below that orbit. If he had said momentum instead of weight he would have been right. The Earth in its yearly motion is circling round the Sun at the rate of 90,000 miles an hour, and but for the attraction of the sun it would, owing to centrifugal force, fly off into space. As it is, the two forces balance at 92,000,000 miles, the distance the earth is from the sun. If the earth's speed were accelerated it would move further out; if retarded it would come in towards the sun.

As long as the Earth meets with no resistance it will keep up its present speed, owing to its momentum, but if it is gradually losing speed, owing to tidal friction, as many think, it will be gradually drawn into the Sun.—I am, etc.,

R. W. PEARSE.

(To the Editor.)

In answer to Mr. Pearse's criticisms on my notes on weight, let me say: First, that "inertia" applys no more to rest, than to motion, it being simply the inherent quality of matter whereby it cannot rest itself whilst in motion nor move itself when at rest; an absolute impotency, and that momentum is not synonymous with inertia. Mr. Pearse says "The weight of a body is simply a measure of the mutual attraction between the body and the Earth," which is quite true, but attraction never acts without resistance, and if that resistance or counter attraction or motion is sufficient to destroy the original attraction the weight due to that attraction ceases; if, however, the counter attraction is insufficient (when, of course, motion ensues), there will be weight, because of the axiom I have laid down: "Unless a body is free to move or in the act of moving it has no real weight."

Mr. Pearse further says: "A body 4000 miles above the surface of the Earth will only weigh one-fourth as much as it would on the surface. This proves my contention and shows that weight is not "intrinsic" in a body. Fig. 1 will illustrate this. Curve (a) indicates the surface of the Earth, the converging lines (b) (b) indicate weight, lessening by distance, a weight of say 1000 tons on the surface of the Earth lessens to 250 tons at (c) which is 4000 miles away; now, continuing this reduction to the vanishing point (d) the weight ceases altogether.

Another sketch (Fig. 2) shows the effect of counter attraction.

At (a) the attractions balance, and the body (represented by a spot) has no weight, because it is "not free to move" either towards (b) or (c), if it occupied the position (d), "it would be free to move" towards (b), and if on the other side of the neutral line (a) at say (e) it would be "free to move" towards (c), and when "free to move" would "have weight."

Mr. Pearse speaks of weighing with a spring balance. I would observe that we cannot weigh a body by a spring balance or any other instrument "unless that body is free to move."

In speaking of the attraction of the Sun, tending to draw the Earth towards it, Mr. Pearse truly says that the centrifugal force balances the attraction of the Sun. Of course the Earth's orbit is the resultant of these forces. Did not the centrifugal force balance the attraction of the Sun, the Earth would tend towards it, and have weight in that direction. As it is, it can only have weight in the direction of its orbit (because it "is free to move" only in that direction).

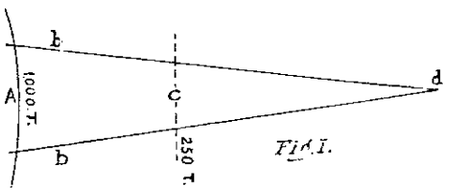


Fig. 1.

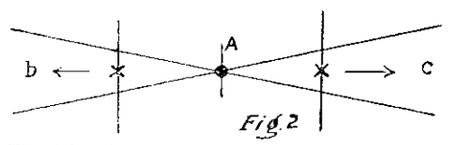


Fig. 2

The following notes on the Law of Opposition may throw some further light on the matter:—

There is a Law of Opposition operating everywhere at all times and in all places. In the physical world, before we can understand the constitution of matter or motion, we must recognise this law, for if we allow that there is more than one atom of material in existence, the plurality of atoms necessitates opposing forces, for atoms must be mutually attracted and mutually repelled, in order to form masses. One force cannot exist alone, for immediately it acts, it must be overcoming another force, and it cannot exist before it acts, therefore force is not force until it is called into action. Supposing, for instance, that the force of cohesion could act without opposition, it would go on acting indefinitely, since there would be no other force to stop it, and the material subject to its action would become denser and denser ad infinitum. Take the gravitation of the Earth. If that power were not opposed, the Earth would die of its own cohesive pressure. It is utterly impossible to isolate a force, for immediately that were done (if it could be done) the force could not act against nothing.

In a mass, when the attractive and repulsive forces balance each other, there can be no motion, because the contrary forces destroy each other; force cannot be quiescent. When, however, forces are not equally opposed, motion on the side of the weaker force makes up the balance, the rate and amount of motion being proportionate to the difference between the forces. Thus matter is subject to everlasting movement, and there is no rest in the universe, but a perenial rejuvenation by motion.—I am, etc.,

PETER ELLIS.

Yachting and Motor Boats of the Dominion

By Oscar Freyberg

Mr. Ted Bailey has received an order from Messrs. Petley, Cording & Seagar for a ketch-rigged auxiliary cruiser of 32 feet length, with 9 feet beam and 3 feet 3 inches draught. She is to be of the tuck stern plumb stem type, and with fifteen hundredweight of lead outside, and a five h.p. Standard engine inside, she ought to be capable of standing a whole lot of bad weather in comparative comfort. Her cabin plan is not quite settled yet, so I understand, but it is proposed to have the galley right forward, equipped with a proper range for coal or wood, so that real cooking may be done, not the Primus variety of cooking, in which a scrambled egg is "either a piece of flannel or something resembling an embrocation," to quote Percy Cotten. Aft of the galley will be situated the engine-room, of just sufficient length to contain the engine, and aft again will be the cabin proper. The construction will be on the bent frame principle, with a single skin of 7/8 Kauri. I hope to be able to reproduce the plans of this sensible cruiser very shortly. She will be just the type of vessel for week-end cruise from Wellington to Port Underwood, Kapiti or Palliser Bay, and I am sure the next two or three seasons will see a good many more of her type in existence.

* * *

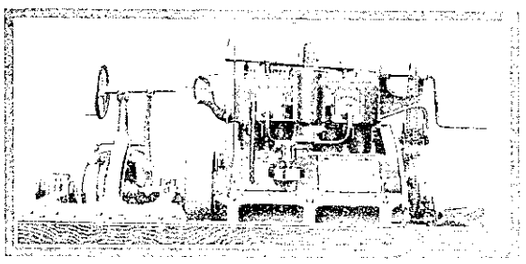
Butt's whaler has been sold to the ex-secondmate of the schooner "Clyde," and is being converted into a half-decker preparatory to being shipped to the Chatham Islands, where her new owner is going to use her for fishing purposes. A good many of our small craft are being gradually bought up and shipped away to swell the fleet engaged in the fishery.

* * *

In view of the fires that have occurred on vessels and launches equipped with internal combustion engines, in some cases with fatal effect, the enforcement of the regulations regarding the carrying of fire extinguishing apparatus is greatly to be desired. It is not generally known that under the new Act all mechanically propelled craft, whether for commercial or purely pleasure purposes, are to be surveyed by H.M. Customs. The surveyor has the power to call for fire extingaishers according to the size of the boat and a box of sand not less than one cubic foot capacity, and the certificate for each craft will only be issued on compliance with the regulations in this and every respect. Enquiry at the Customs elicited this fact, and also that the work of inspection was gradually being gone on with, so all you motor boat and auxiliary owners who have not yet complied with the regulations had better do so before the Customs Surveyor comes aboard.

The yawl "Ethel," at present on the slip at Martin's Bay, is to have half a ton of lead added to her outside ballast as soon as Ted Bailey can find time to do it.

The now defunct Thorndon Dinghy Sailing Club, upon winding up its affairs, invested its surplus funds in the purchase of a Perpetual Challenge Cup "to encourage small boat sailing in Port Nicholson." Mr. F. H. McKeever, a once prominent member of the Club, and now secretary of the trustees for the Cup, reports that the conditions governing the competition call for an annual series of three races open to round and square bilge craft of not more than 14ft. over all measurements. The boat scoring the highest aggregate points holds the Cup for 12 months, when it reverts to the trustees and is again presented for competition. Last season the races were held under the flag of the Heretaunga Boating Club. Mr. Taylor's "Hinaa," with a total of 7 points, was the winner. "Runa," "Wai-iti" and "Marguerita" tied with four points each for second place, and "Gil-Blas" scored two points. The Cup will be presented at the Heretaunga Club's Smoker, which takes place shortly. It is at present uncertain under which flag the next series of races will be held.



We illustrate a Thornycroft 4-cylinder marine engine developing 47 b.h.p. on kerosene. Messrs. Hatrick & Co., Ltd., have recently ordered one of this type of engine, and are installing it in one of their river boats. They have been using Thornycroft motors for some eight years now, and appear very well satisfied with them.

* * *

The first stage of the test of Kapai v. Scripps engines has concluded with the third run of the Scripps engine in "Coquette," the 32ft. launch built by Messrs. Lane & Son specially for the trials.

In the first test "Coquette" completed the Auckland Power Boat Association's course of 6½ knots in 43min. 5sec., which works out at 9.05 knots.

On the second day the weather conditions were not quite so favourable, and the test was run the reverse way to the first. The time taken was exactly 43min. This shows a slight gain of speed –9.07 knots.

The third run took place under ideal conditions, and the same course was followed as at first. The time taken was 42min. 37sec., showing a gain of 23sec. over the second test, and works out at 9.15 knots.

The tests are now over as far as Messrs. Lane & Co. and the Scripps engine are concerned, and it remains for Messrs. Arthur & Dormer to instal their Kapai engine in "Coquette" and make their three runs. The result of these unique tests will be awaited with interest by all motor boat users, as this is the first competition of the kind held in the Dominion.

* * *

The yawl "Ngaira," 9 tons, at present on the Wellington Patent Slip, is undergoing general overhaul, and is having an 8 h.p. oil engine installed as an auxiliary to her sails.

* * *

The "Waitangi" auxiliary ketch, 27 tons, is on the same slip, and is having an extensive overhaul.

* * *

Ted Hannan's auxiliary yawl "Wairangi," on the "Hard" in the Boat Harbour, is having her keel re-modelled and the engine shifted aft.

* * *

"May," "Rawene," and "Tangaroa" expect to make an early start for the coming season by launching within the next week or two.

* * *

Mr. C. J. Ward's "Lizzie" is still at her moorings in the Boat Harbour awaiting a purchaser. I can thoroughly recommend this litle flier to anyone wanting a boat of her class. Mr. Ward, if he sells the "Lizzie," intends building a larger boat for first-class and ocean racing this coming season. Should the "Lizzie" remain unsold she is going into Ted Bailey's hands to be "raised on" six or seven inches, that is to say, she will be given more freeboard, new decks, deck-house, and also cockpit draining to sea, and will cut a figure in the next ocean race.

* * *

Last month I promised plans of a 20ft. cruiser from the board of Mr. Sinton. I have much pleasure in showing them on the following page. I must say that for accommodation and comfort below decks I have never seen the equal in a 25-footer, let alone a 20ft. boat. She will sleep four persons comfortably on the berths, which are nearly 3ft. wide and a full 12ft. long each side. The floor space—2ft. 6in. wide—is much better than the average 35ft. deep keeler has. A neat folding table provides room for four to sit at meals. The stove can be placed on the floor under the bridge deck, while lockers at the sides of, and under the cockpit, will provide stowage space for pots, pans and dishes, provisions, etc. There are also lift out lockers under the cushions of the berths. The space right forward might be reserved for anchors, warps, spare sails, etc.

While this craft is very comfortable, and about as sane and healthy a little cruiser as could be devised, it must not be supposed that she will be slow; on the contrary, I am of opinion that she will be very fast, particularly in a blow if not over-canvassed.

The sail plan shows a spread of 320 square feet. This should be a very useful

rig for cruising, but the boat would stand fully another 100 feet without being over-canvassed.

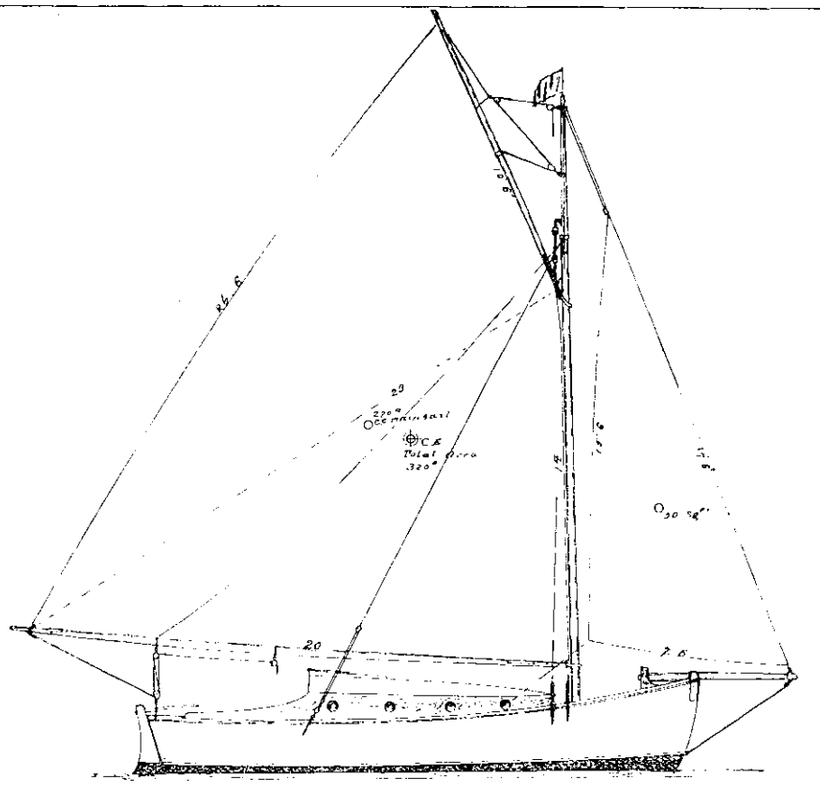
I have shown the plans to several Wellington yachtsmen, and they are unanimous that she is just the thing for our waters, and one of them expressed a determination to get one built. His order will be placed shortly. I shall be pleased to hear from anyone interested, and to answer any inquiries.

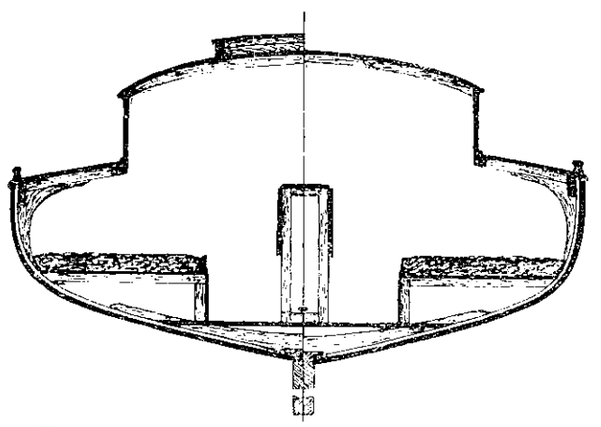
Details of 20-Footer.

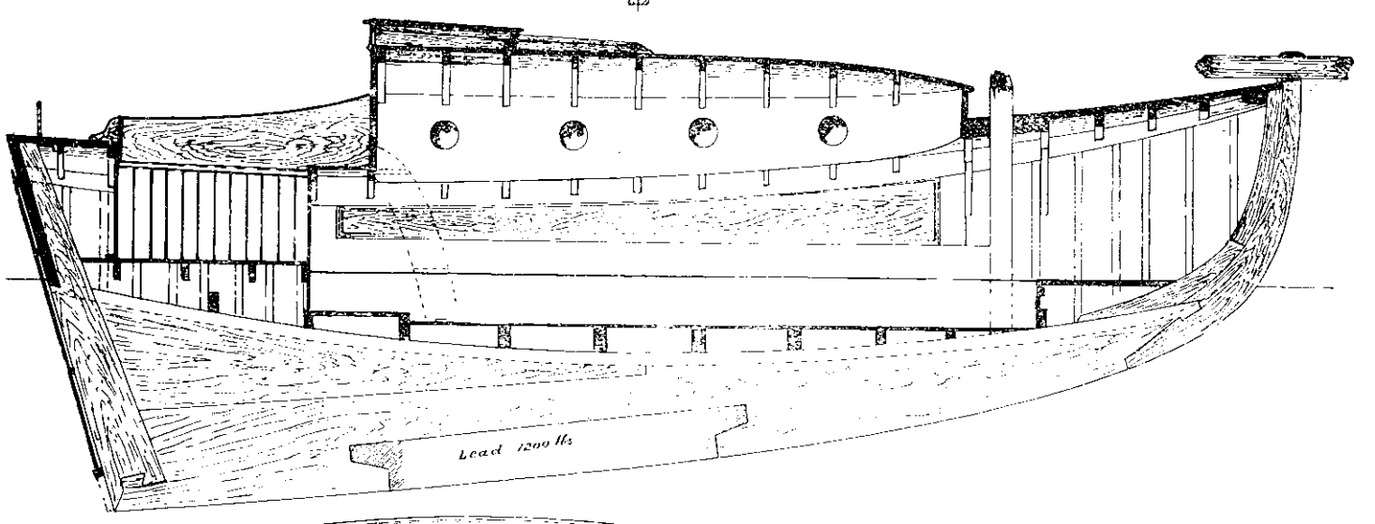
Length O.A.	20ft.
Beam	9ft.
Draft	3ft. 6in.
Freeboard Greatest	3ft. 3in.
Freeboard Least	2ft.
Headroom	4ft.
Accommodation	Sleep 4 on Berths
Area of Sail for Cruising	320ft.
Lead on Keel	1200 lbs.

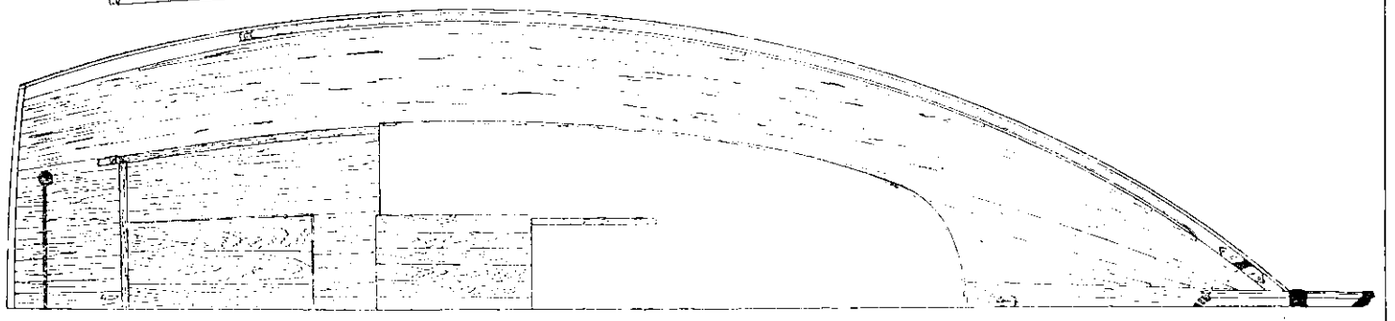
Yacht to be built of one ¾-in. skin kauri, and any other particulars you may wish to include.

Total cost complete, about £90.









Aviation

(By our English Correspondent).

Coronation Precautions.

The fiat which has gone forth making it an offence to throw "largesse" to the Coronation crowd has not caused even a shade of annoyance to cross the motorist's visage. The same may be said of the Bill now before Parliament which seeks to debar the aeroplanist from flying over the Coronation procession, or the crowds surrounding it.

The wise men at Westminster are probably more or less convinced that this statutory embargo will be effective. I cannot believe so; though it obviously will restrain a certain number of airmen from attempting such flights. To fly over dense crowds is a crime at the stage at which the art now is, and the punishment should fit the crime. The rub is how to make it.

An aviator, laughing up his overall sleeves, can feasably set out for, say, Brooklands, can rise to the height of 3000 feet or so, and can hover over the crowd with a confident knowledge that all the King's horses and all the King's men cannot identify him with a precision sufficient to bring retributory justice on to his head. Even should his engine fail him, he can glide at an angle which would land him many miles away. Should his machine collapse and fall, the authorities will then certainly fail to identify his mortal remains as being those of anyone in particular.

I think, however, that this Coronation order has brought the whole question of flying and flying rights most forcibly to the front. A very grave question it is too. Our fleet, our forts, our cities lie at the mercy of those antagonistic to us. Were I an Anarchist I would seize this opportunity to wipe out the crowned heads of Europe which will be aggregated in the Coronation procession. And I would do it with a tolerable good chance of saving my miserable carcase.

In the case of the aeroplane the law can be made as a Laughing Jackass. It remains impotent until such time as man's temporary supremacy over Newton's law of gravity is interrupted. To me, I see no chance of controlling the flying man except the strict co-operation of the authorities and certain accredited aviation societies. Give the latter the official hall-mark is my advice, and make it a grave offence for anyone to build or own a machine without the leave and license of the controlling bodies.

Areo. Uncertainties.

To witness, as I have done, aeroplanes circling over cities, to see them making the *vol plane*, coming to rest, and starting off in a space of fifty feet or so, leaves the impression that there is no specific art in flying, and that its dangers are few. Such is far from being the case. I have also seen Bleriot turn turtle and writhe amid the flames of his burning monoplane. I have seen Latham (only two days ago as I write) projected to earth, his controlling gear broken; I have seen that much-honoured, deceased pilot, Cecil Grace, flying steadily one moment at an altitude of 300 feet, and the next drop fifty feet in a "hole" in the air. And I read to-day that a similar occurrence was met with by M. Hamel on a recent flight across country. This latter type of accident is similar to that which ended Poor Chavez's life at the very moment when he had completed his flight over the Alps. It also caused the death of the Hon. C. G. Rolls.

M. Alexandre See, who has studied aerial phenomena for many years, claims to have discovered the cause of these unexpected "holes" in the air, and also how to avoid suffering from them. A "hole" in the air is a simple description of a zone of comparative calm—comparative to the velocity of the air contiguous to it. Let us suppose an aeroplane coming down against a wind of 10 yards per second at a speed of, say, 20 yards per second. It enters an "air-hole." The effect is that the front planes are relieved of the wind pressure and drop down and forward. Not so the tail plane. This is for the moment opposed to the 10 yards per second wind, and, therefore, remains sustained long enough to alter the trajectory of the machine as a whole, with the result that it dives precipitately.

M. See advises aviators to go slow when approaching the earth and when in the vicinity of trees, for these calm-zones exist principally in such localities, and to be on the *qui vive* to start up the engine if, and when, the front of the machine shows a tendency to pitch downwards, so as to give it the added impetus needed to sustain it.

News from the Front.

There has been a regular plethora of star motor turns of late, and in consequence we have had a proper Roman Holiday. I may say the metaphor only serves in part, and not in the matter of the fatalities usually associated with the latter occasion. Of course the Coronation and the subsequent festivities have given a fillip to the amusement lists. We have, of late, witnessed the breaking of records in the world of motordom, both in the air and on the land; and we, who appreciate, marvel at the never ceasing progress of invention, and we wonder where it will all end, if end it does. The International Aviation Circuit, the very wonderful "circuit of Europe," has progressed to a really brilliant finish. It began with a series of accidents which made the pessimists shake their heads. Then, again, the weather conditions were of the vilest, and upset all the initial arrangements (as well as many of the contestants). Competitors had to remain weather-bound in the "control depots"; irregular starts were made, and an air of doomedness was on all of us who watch and take the notes to provide motor pabulum. Therefore the performance of the six competitors who finished in Paris is one of the marvels of the year. Think of it. A covey of aeroplanes set out from Paris with flying orders to cover a circuit of a large portion of Europe, including the trip over the English Channel, and a visit to London; thence back across to France again, and "home" to Paris. Of course there have been many casualties by the way. But what of that?

Who would have guessed a couple of years ago that humans could do deeds such as this I have told you of? No one would have dared predict it with much conviction in his voice. I remember how the sight of the aviators at that first flying meet that ever was held moved me to exclaim that the dirigible balloon as a potential fighting unit was found to be surpassed by the aeroplane. I was ridiculed. Was I right? I think so, if we judge by the "circuit of Europe." What dirigible has performed as well? (I say "has" advisedly, for the dirigible has had the start of the aeroplane, and therefore possesses no excuse if it has not "made good.") No motor balloon has ever been designed that could have battled into the teeth of the gale as did these aeroplanes the day they left Brussels.

So it has come to pass that while the scoffing words were yet in the throat of the jeerer, the scientist and the pioneer have effected a revolution.

All this is a digression from concrete fact. With the excuse that it was warranted I pass on to details of the race. The English position of the trial was most interesting, and the effect of aviators flying across the channel in flocks was stirring to a degree. The stage management of affairs was bad; why else did we have to tumble out of our beds to receive the machines as they arrived in London a little after six a.m.? This hour may be just the thing for executions, but it is disheartening to the "pore journalist."

The following is a list of the men who have completed the circuit of Europe:—

	H.	M.	S.
(1) Beaumont (Bleriot Monoplane) ...	58	36	45
(2) Garros (Bleriot Monoplane)... ...	62	18	34
(3) Vidant (Deperdussin Monplane) ...	73	32	—
(4) Gibert (R.E.P. Monoplane)... ...	89	45	54
(5) Kimmerling (Sommer Monoplane)...	93	10	24
(6) Renaux (Farman Biplane)	110	44	5

The victory of Beaumont, who is a French naval officer, is most popular, and indicates the go-aheadness of the French authorities. Hard luck befell the only British machine, the Bristol, on the last stage. It had shown very consistent running, considering that the pilot, Tabuteau, used the same machine all through (unlike his fellow competitors). The Morane monoplane did fastest time on every stage, but Vedrines, the pilot, was unable to pull up the loss of time caused by his twenty hour delay through accident.

So much for the circuit of Europe. It has taught us lessons, and amongst them that the monoplane is the only thing for speed events, but that for reliability the biplane has nothing to learn. Again, this race shows us that, in a time interval far less than the most sanguine could hope, the aeroplane has "made good" and constitutes a naval weapon, the possibilities of which are so illimitable that the designer of Dreadnoughts begins to think the name he has chosen for his floating fortresses is a misnomer.

Astronomy & Science

Astronomical Notes for September.

(Hon. Director Wanganui Observatory.)

The Sun is in the constellation Leo till the 18th, when he enters Virgo. His northerly declination decreases till the afternoon of the 24th, when at 3hr. 48min. he crosses the equator into the Southern Hemisphere and spring commences (according to the almanac) in these latitudes. Sun spots have been seen during the past month, in the higher solar latitudes to the south of the Sun's equator foreshadowing the time of minimum spot activity. Observers should watch carefully at these times, for any sudden return of the regions of active eruption to the equatorial zones.

The Moon, in her monthly circuit of the heavens, comes into the vicinity of the planets and some of the brighter stars, and serves as a convenient pointer to them. She will be near Saturn on the morning of the 14th, Mars on the following morning, Mercury on the 21st, Venus on the same date, Jupiter in the evening of the 26th. Her path through the constellation visible in our evening skies, at about 8 p.m., is as follows:- -In Scorpio on the 1st and 2nd, and nearest the bright star Antares on the 1st, Sagittarius on the 3rd and 4th, Capricornus on the 5th and 6th, Aquarius on the 7th, 8th and 9th, Pisces on the 10th and 11th. She will again be visible, as a crescent, in the west, in Virgo on the 26th, Libra on the 27th, Scorpio on the 28th, and near the star Antares on this date, and in Sagittarius till the end of the month.

Phases of the Moon in New Zealand mean time: --

First Quarter ..	1 day	3 hrs.	51 min. a.m.
Full Moon ..	9 days	3 hrs.	27 min. a.m.
Last Quarter ..	16 days	5 hrs.	21 min. a.m.
New Moon ..	23 days	2 hrs.	7 min. a.m.
First Quarter ..	30 days	10 hrs.	38 min. p.m.
Apogee	2 days	6 hrs.	33 min. p.m.
Perigee	17 days	5 hrs.	30 min. p.m.
Apogee	30 days	1 hr.s	5 min. p.m.

Mercury is an evening star at the beginning of the month, rapidly passing into the Sun, with which he will be in inferior conjunction on the 10th. His eastern elongation, in our evening skies, where he has been seen during the past month, under Venus, has been a fairly favourable one. He will be in conjunction with the Moon on the 21st, at greatest western elongation on the 26th, and in perihelion on the same date.

Venus has been a resplendent object in our evening skies during the past month. She is now moving rapidly towards the Sun, and will be in inferior conjunction on the 15th. It is interesting to the telescopist to trace the slender bright crescent right up almost to the time of conjunction. She will be in conjunction with the Moon on the evening of the 21st.

Mars is an evening star during September, rising shortly before midnight, at the beginning of the month, in the constellation Taurus. He is in conjunction with the Moon on the 14th.

Jupiter is, owing to the departure of Venus, once again the evening star, and the only one of the bright planets visible in the early evening. His surface markings have been seen to considerable advantage on several occasions during the past month, the detail, especially in the Southern Hemisphere, changing rapidly, and several dark regions in his temperate belt being very conspicuous. Though getting well over to the west he will well repay the observer, who views him in the early evening during the month. He will be in conjunction with the Moon on the evening of the 26th.

Saturn is an evening star in Taurus, and close to Mars at the early part of the month. He rises about midnight, so is out of the list for early evening objects. He will appear stationary amongst the stars on and about the 3rd, and will be in conjunction with the Moon on the 14th. His ring system is now well inclined to our line of vision, and forms a glorious spectacle in a telescope of fair dimensions, but the observer who wishes to view him must stay till the early morning hours to get the planet at a fair altitude.

Uranus is an evening star in Sagittarius, retrograding at present. He will be in conjunction with the Moon on the 5th.

Neptune is a morning star at this time in Gemini, having a forward movement. He will be in conjunction with the Moon on the 18th.

The Stars and Partial Impact

(R.A.L.)

If one thing is better known than anything else in this Dominion, it is that Professor Bickerton originated the theory of Partial Impact to account for the behaviour of the new stars which has perplexed so many astronomers. The agitation of the energetic professor is familiar to the people of the Dominion now, and has been so for the past forty years. Some have laughed, some have applauded, many of the most judicious and best instructed have added their weight of approval. This is why the Governor-General of Australia gave a handsome subscription to enable the professor to go to Europe to prosecute his claims to the discovery of his new system of the creation of worlds, and to get his theory accepted by the world of astronomers. It is astounding to read in a recent issue of the "Scientific American" (Feb. 18, 1911), a treatise giving the credit of the whole discovery to another individual altogether.

Svante August Arrhenius, the founder of the Theory of Electrolytic Dissociation, is declared by his biographer, Professor Ostwald, to be the discoverer of the things which Professor Bickerton published to the world long before Mr. Arrhenius was heard of. Certainly I remember Professor Bickerton unfolding his theory of Partial Impact in 1875, when Mr. Arrhenius was sixteen years old only, and had not yet entered University life—which he did later in 1876, at Upsala as a rather precocious but very energetic and able student of mathematics, physics, and biology. The precocious young Swede became famous in due course by the exercise of his remarkable talents, and attained a position in the scientific world in derogation of which I wish to say nothing here whatever. He is now director of the Nobel Physical Institute, which position is a guarantee of the strongest for his proved capacity and advanced leadership. Nevertheless he did not place that new system of creation or re-creation before the world before Professor Bickerton. He published, it seems, within the last four or five years a book entitled "Worlds in the Making." His biographer says it exhibits his characteristics splendidly—his "independence, startling boldness of conception, the ability to regard apparently disconnected facts from a common standpoint, and a masterly simplicity and comprehensiveness of result and statement." All of which may be true, no doubt is true, but not truer than the fact that he was not the first to give the world that theory of "Worlds in the Making." Bickerton gave the same view to the world long before. From the "Scientific American" it seems to be the same theory as Bickerton's: "A vivid picture of two giant suns, chilled to black cinders, but still imprisoning within their frozen shells a fierce heat and compounds of terrific explosive energy, crashing together in a celestial head-on-collision. When that occurred each sun was rushing at the rate of 400 miles per sec.—two enormous bodies travelling at such speed cannot be suddenly arrested without in some way disposing of their energy." They blaze forth, their gases rush out into space at different rates, as revealed by the spectrum, there is a steady dying down and in the end, out of the debris new planetary worlds are formed, and go rushing on just as those known to us. Now this much is what Bickerton said in 1875, over thirty years before, has said in the columns of PROGRESS repeatedly, and is saying with not too much success from the scientific world -or too much courtesy we regret to say—now. The only difference is that Arrhenius speaks of a "head-on-collision," whereas Bickerton calls it "partial impact," otherwise of "grazing collisions." But the whole theory is the same, and it is strange to find the younger man appropriating it entirely without a word or a bow of acknowledgment of the writings of the older. It may, of course, be a case of independent work, as happened with Darwin and Wallace on the most famous occasion in scientific history. These men, however, were contemporaries in the exact sense, but between the published works of the other two there are thirty odd years. This is a matter which ought to be cleared up.

It is true that the theory has not been accepted from other genius; many go no further than claiming that it proves that still there are men who invest scientific research with Homeric grandeur. But even if it be only "Homeric grandeur" let credit be given where it is due.

Motors and Motoring

Spread of the Automobile.

(By "Watchman.")

At first it is not encouraging to the student of progress to view the Coronation as a landmark for the history of the machine. The reason is that in the Coronation procession the horse was to the machine in the proportion of the wealth of Leadenhall Street to the China orange. But for that there was the very satisfying reason that the horse is a creature that lends himself to pageantry, which cannot be said of the automobile even by the most interested of its friends. But there were automobiles for all that at the big pageant. The first thing that strikes me is, "How did they keep their places?" I ask because I have a vivid recollection of attending a funeral not many weeks ago in an auto, and though the machine was driven exceptionally well the pace was killing. That is to say, it was so slow that the machine simply could not keep back to the horse vehicles. We would let her out for awhile when the road was favourable, and keep on passing the traps until we got near the head of the procession, and then we had to stop and watch the traps pass us in their long, weary file; and by repeating the process of letting out and stopping alternately, we reached the cemetery without mishap. How this difficulty was got over by the autos in the Coronation procession has not been explained. It is obvious that they could not have been allowed to do the passing and waiting trick. How did they do it: I observe that the aggregate of them was under many marshals, who waved white flags and kept order and were, by the way, more respected than the police themselves by reason of the flag aforesaid. But the difference between the paces of the animals and the machines is so radical that I cannot imagine how the trouble was met.

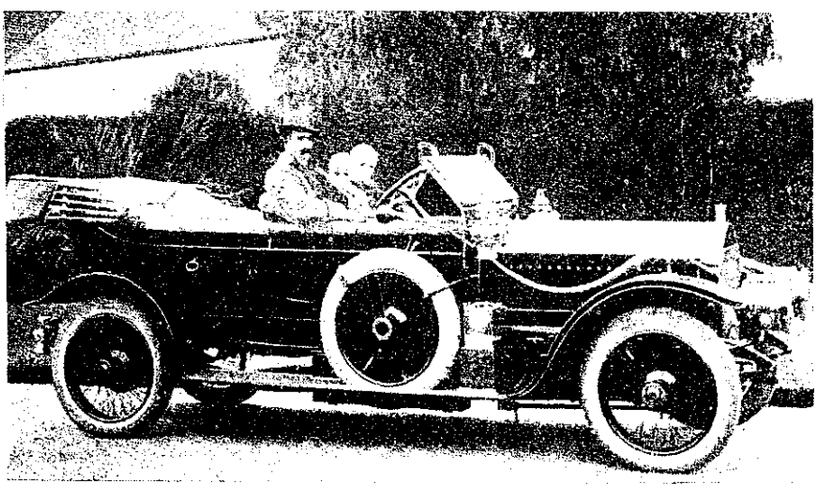
This, however, only serves to bring up the real significance of the Coronation as a landmark in the history of the street traffic of the modern Babylon.

In 1902, during the Coronation of Edward VII., there were in London no motor cabs, less than twenty motor buses, and "fifty commercial autos" would have been an exaggerated estimate. Nine years have elapsed, and King George V. has been crowned. It is announced that now there are in the big city 7000 motor cabs, 1500 motor buses, and 5000 commercials. These are the figures of Greater London. Thus we can measure the extraordinary development of what was regarded ten years ago as a method of locomotion with a very dubious future, as the comic journals did not fail to assure the world.

But this does not exhaust the comparison, for it does not enable us to realise without some thought the greatness of the service done to the traffic of the big city by the auto. The vast crowds, unprecedented they were described as being, moving about the city for days before the event, and the heavy goods deliveries, put the traffic facilities to a strong test, and made many observers wonder whether but for the auto there would not have been a complete paralysis at times of the whole traffic of London.

The elements are: (1) the aggregate length of the vehicles passing down a given street, and (2) their speed. Now the auto is shorter than the average vehicle plus its horses, the estimate being that in any given length fifty per cent. more autos will find room than the horse-drawn. Their speed is, on the other hand, estimated at 60 per cent. better. Further, there is no fear of backing or the other unexpected manifestations of the restless horse, and the autos can, therefore, keep up closer one behind the other. Moreover, the turning is much shorter and better with the machine. For all these reasons it is estimated by good judges that the presence of the auto in such numbers in the metropolis has improved the pace of the traffic through the congested parts of the city nearly twice and a half.

But the traffic, it was remarked by the same class of observer, was never far short of the limit of the possible. Therefore it is a good thing for the traffic that the horse has passed, as the saying goes. In fact, had he not passed the traffic would never have passed. The traffic, but for the development of the automobile, during the last nine years would have been as effectually blocked as it was the other day by the big strike, with this difference, that no amount of agreement at the instance of benevolent authorities to give extra wages could have got it to move a single inch. The automobile has then developed into one of the necessities of the age. It is lucky the machine is now so reliable.



A 65-H.P. 6-CYLINDER NAPIER CAR.
—*Australian Motorist*

The Motor in Australia.

(Written specially for PROGRESS.)

The Show Question.

The use of the motor on the Australian Continent is now very widespread, and it is accompanied by all the conveniences in the shape of factories, garages, and the rest. Every State has its automobile clubs and associations, and the Motor Show is a regular institution. Manufacturers and importers are, however, beginning to fight shy, declaring that the best business is done in the garages. It may be another, probably is, of saying that the trade resents what it calls the extortionate charges of the Show authorities. A controversy is going on in the motor journals, the friends of the Show maintaining that the chief use of this form of appealing to the public is educative, and that without it the garages might not be able to do the business they are doing. It is the old battle which everywhere is fought between the parties on the occasion of every Show, whether might not be able to do the business they are doing. It is the old battle which everywhere is fought between the parties on the occasion of every Show, whether agricultural or industrial.

The Road Question.

In Sydney there is a proposal before the Legislature to tax motor vehicles for the improvement of the roads. Motorists welcome the same, but have a suggestion, namely, that all vehicles should be treated alike, maintaining that the motor takes less out of the road than most other vehicles, especially the heavy waggons with narrow tires of iron. There are 83,000 miles of road, and the tax confined to motors would not reach £20,000. They object to the impost as tantalising without being effective. It is worth remembering that they support their assertion of the superiority in this respect of the motors by quoting Paris experience. Some five years ago the fast motor traffic

was given the centre of the highways of the French capital, the rest of the road being left to the other traffic. A report made the other day is to the effect that whereas the sides are much worn, the centres are as good and fresh as the day they were made. As these highways are all wood blocked, the test is valuable only for wood blocking. For countries in which macadam is the usual road material, another test would require to be made.

In Victoria the motorists are agitating for the Government to face the problem of the "disgraceful" roads, placing "this valuable asset of good roads on a sound workable basis." The Government has announced its intention of floating a million loan for the roads. There is hope in the motoring breast and a plan is developing for bringing pressure in the direction of getting the right sort of roadway installed.

In Tasmania, I see from the account of a motoring tour made by some Sydney people through the "tight little island," that the roads are excellent. The main road through the island from Hobart to Launceston is described with delight, as is the road to the goldfields, forty miles from the latter city, through most picturesque country. Also some good roads were met with on the eastern side of the island. Petrol, moreover, was obtainable everywhere. Once in the heart of the forest they ran out, but finding a telephone within a couple of miles, they had a motor cyclist alongside in no time out of some bush township with all the petrol they wanted. It is a good country to motor in and that is worth remembering by motorists.

In Queensland the road question has hardly attained to motoring dignity. "Our roads," writes a correspondent, are under the control of the various localities, and are largely in a state of nature. There is a movement among the Shire Councils for organising a large expenditure with the help of the State in the right direction. The Motorists are cheerful and talk about putting the money into the hands of a non-political board. They must have got some stray copies of some of Mr. Herdman's speeches. What are the motorists of the Dominion doing about the road question?

The Boulogne Light Car Race.

(Our English Correspondent).

We all know how the competitive spirit has been on us, so let us turn to the *piece de resistance* in "motor-cardom" (to coin a horrible word). This international race for four-cylinder cars, with a maximum cylinder capacity of 3 litres, was run off on Sunday (25/6/11). The course was a triangular lap of 32.18 miles, which had to be covered twelve times, i.e., 386 miles in the aggregate. Of the forty-four cars that entered, thirty actually started, but only a sad thirteen finished. (Reader: Compare this proportion with that of starters and finishers in the air circuit described on page 803.)

Thus do I epitomise, in American style, the ruling factors in the race. Let me comment now on some incidents that outstand. De Manne, on the first Gregorre, got away first, sharp to time, with much crackling of exhaust and skidding of wheels. Next off was the great Boillot on his wonderful Pengeot (Lion type). One could see that Boillot was determined to cut much ice before he switched off. He did. The Arrol-Johnston now caught our eye, for on it and its confreres and its mates, the Calthorpe, Vauxhall and Sunbeam, rested the hope of England. The Arrol-Johnstons were neat, speedy beauties, and before the day was out had shown the world that, if not the very fastest things on wheels (wire wheels at that—Rudge's) they were certainly the most regular. Lap after lap did they reel off, and it would take more than a Swiss stop-watch to be as accurate timekeepers.

With a lap distance of 32 miles, and thirty starters at minute intervals, it was to be expected that interest would not languish. The last car had barely been despatched when a booming roar announces an oncoming competitor. It is Boillot, who had swung his Pengeot round the circuit in 34min. 16sec. a record for the day. One of the Calthorpes, however, nearly equalled it, doing 34min. 47sec.

This first lap started the process of elimination, for no less than five machines were "done in" and were heard of no more. But what else would one expect with this monstrous rush round a 32-mile track, replete with all manner of bumps, bends and "devils' elbows"? Lap by lap the ranks thinned, and our British spirits oozed. Calthorpe No. 1 was dropping back. The Vauxhall had melted out a big-end bearing, and Calthorpe No. 2 was "down and out." A strange accident befell this latter. I have it direct from the driver's own lips, as follows: "My Calthorpe was as capable of winning the race as any. It possessed speed, I assure you. You can judge of this when I tell you it actually did 55 miles an hour on second gear up-hill, 78 on third, and 86 on the geared-up top. The engine measures 79½ x 150 m.m. My fate, however, overtook me after I had done four and a-half laps, and had stopped for replenishment of petrol. Possibly it was my "doggy" French that caused the misunderstanding, for the official who came to fill up my tank poured in water instead of petrol! It took me five minutes before I found this out, and 90 minutes ere I got going again. Calthorpe No. 3 also had bad luck; a petrol pipe broke in such a way that it was beyond human ingenuity to repair it in time."

And so, after all, the race went to the French, a Delage winning (7hr. 2min. 52sec.), the Pengeot second, and Delages third and fourth. Note must, however, be made of the fact that the Arrol-Johnstons all finished well. Incidentally it must be added that Rudge-Whitworth wheels were in almost universal use.

Next day England had her reward, for a Calthorpe won the Hill-climbing test, tearing up a frightful gradient through the town of Boulogne, round hairpin and hair-raising corners, at an average of forty miles an hour.

The Motor Cycle in 1911.

In this year men have discovered, what they have long suspected to be the case, that the motor cycle is everywhere and in the hands of everybody for both business and pleasure. The fact was noticeable before, of course. But in 1911 it has acquired by persistent and general practice the force of a revelation. Merchants, office men, mail carriers, the clergyman on his way to the sacred offices of his sacred calling, the medical man hurrying to the bedside of a patient, the traveller in search of orders—all have their cycles and all are keen cyclists. The first thing this universal use signifies is the reaching by the machine of a stage of reliability and a standard of comfort very different to the earlier experiences. The type is heavier in 1911 therefore.

An improvement greatly to be commended in many of the types of the year is more room for petrol and lubricators, which means longer journeys and less work at the tanks. And there is a new style of spring forks. Nor has transmission been forgotten. We read of an improved roller chain and a waterproof-tanned leather belt, which have reduced transmission troubles to a minimum, and are very popular among the cyclists of the States.

The Tourist Trophy Motor-Cycle Races

(Our English Correspondent.)

The blue riband on the motor cyclists' racing calendar is the Tourist Trophy races, held in the Isle of Man. The race is for "standard" machines as far as design goes, and, moreover, there is a strict limitation of engine dimensions. This year we had a "Junior" race for lightweights. Thus were there two events altogether. The senior being open to either twins of 585 c.c. capacity or singles of 500 c.c., and the Junior to either twins of 340 c.c. or singles with a maximum of 300.

In the Junior race, which was run first, the following was the result: A splendid win for the Humber.

Machine and H.P.	Cyls.	Bore and stroke.	Cubic capacity.	Time.
Humber, 2¼ h.p. ...	2	60 × 60	330	3 37 7 1
Matchless, 2 h.p. ...	1	76 × 65.5	297	3 16 20–2
Forward 2¼ h.p. ...	2	56 × 60	330	3 55 56 5
Humber, 2¼ h.p. ...	2	60 × 60	330	3 56 24 4
Enfield, 2¼ h.p. ...	2	64 × 71	449	3 56 34 5
N.S.U., 2½ h.p. ...	2	53.6 × 75	338	3 57 23–6

The Senior race was the centre of attraction, for was it not a fact that the great Jake De Rosier, the American "speed merchant," was competing? Moreover, the American "Indian" machines were entered, a goodly bunch of them, and they were out after scalps.

It was a fine race, and the result will be better appreciated when I tell you of the course. The Tourist Trophy race was, this year, over a distance of 187½ miles, comprising five circuits of the route. The difficulties which the riders had to face were herculean: and as Jake De Rosier put it, "This was no tea party." The road winds up hill and down dale; and over mountain passes of no mean order. Moreover, there are acute angle turns and hump-backed culverts which have to be jumped at speed. He who enters for this race does so with a certain knowledge that he has many falls ahead of him. There is nothing worse than a headlong spill at 50 to 60 miles an hour off a motor cycle.

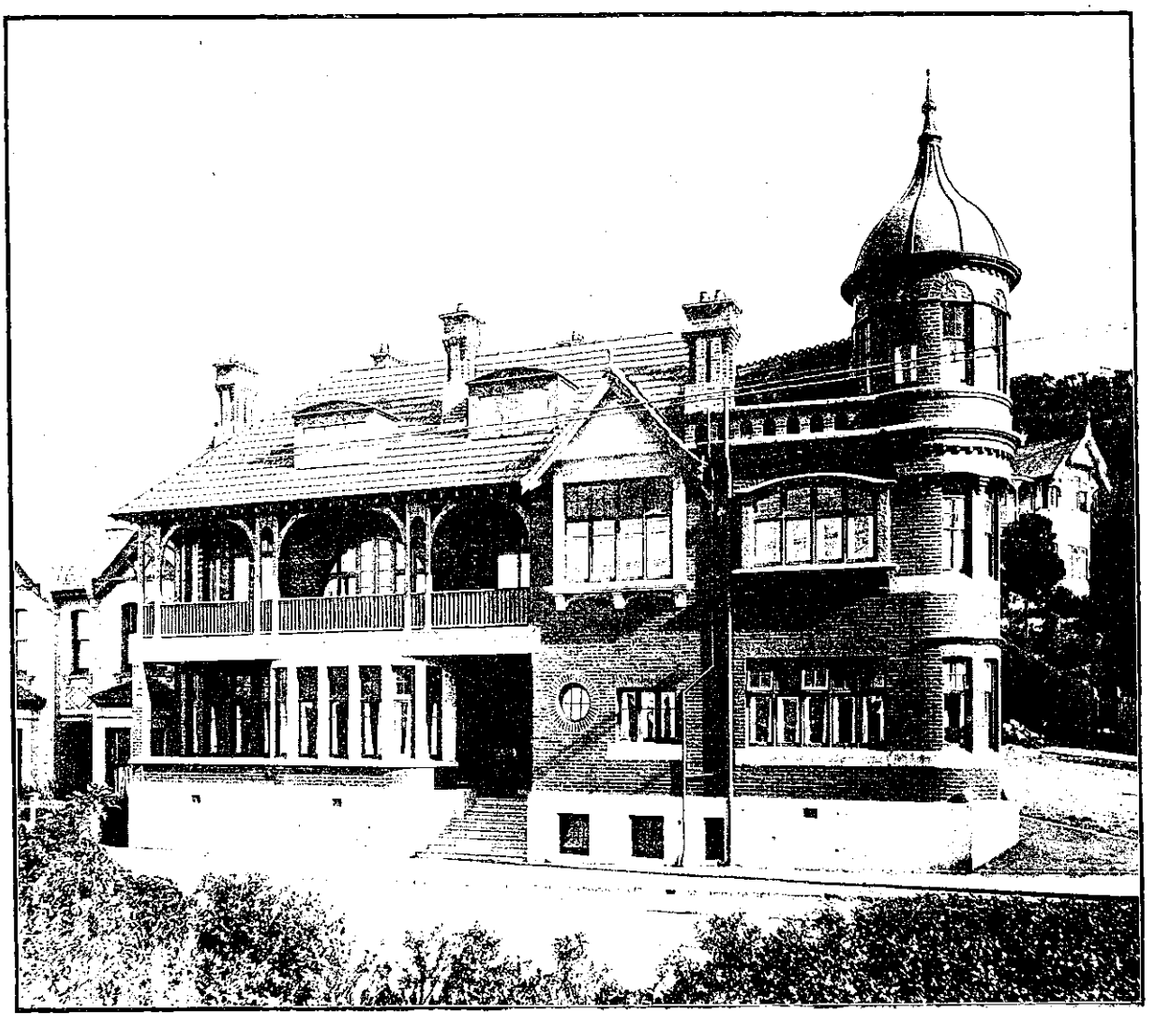
I told you the distance was 187½ miles. This the winner (on an Indian) covered in 3hrs. 56min. 10sec. If the rate of travel be computed, we find the average is approximately 45 miles an hour. "Jake" did not win; in fact, he finished all down on this tilt, and, at that, was disqualified.

Architecture and Building

A New System of Ferro-Concrete House Building.

By Peter Ellis.

The basic principle consists of erecting ferro-concrete studs cast in moulds, the steel reinforcement being put in when the studs are cast. One dominant pattern is used, so shaped in section that it may be used at all corners, window openings, intersection of walls, partitions, etc. Fig. 1 (p. 808) shows the shape of the section. Numerous holes for steel wires are formed in the studs, these wires being put in as he work of filling up the space between the studs progresses (see Fig. 2). The size of the studs is the full thickness of the walls, so that when the planks for retaining the concrete are placed against them the space between the planks is the right thickness for the walls. These planks are held in place and kept from pressing outwards by small bolts through them, the holes made by the bolts being filled up afterwards, together with the unused grooves in the studs. The roof of the building is flat, roof and ceiling being all in one, the underneath side being level and the top slightly sloping to drain off the water. In order to carry the weight of the concrete roof, light steel beams are introduced, spaced about four feet apart, the beams projecting upward above the flat of the roof, bedded in concrete and cemented over. These beams are made of light steel angles and steel wire, and their ends are hidden by a sloping parapet which also forms a semi-rooflike finish all round the front and sides of the building. The foundation of the building has pockets or mortices formed in it about an inch deep to take the studs when they are erected, these mortices, of course, being set out where the walls and partitions are. The windows form the chief ornamentation of the exterior of the building. They are made bold and ample, framed up in wood and fitted with easement lights and bolted against the outside of the walls, openings being formed in the concrete walls to suit. They are roofed over at the top and a window seat 18 inches from the floor is formed at the bottom, the glazing being in ornamental patterns with lead lights. Of course the internal arrangements can be arranged to suit the fancy of the owner. The main feature of this style of building is in the stud work, which enables the builder to erect a building very expeditiously and cheaply. There is no doubt that wooden buildings will be superseded by more substantial material, and there is no reason whatever why buildings in ferro-concrete cannot be erected as artistic and comfortable, and of course more durable. It is a material that lends itself to an easy formation of arch work and internal decoration, to say nothing of comparative fireproofness and general sanitary effect. Portland cement,



RESIDENCE OF MR. THOS. FOGG, GEORGE STREET, DUNEDIN. E. Anscombe, Architect. (see p. 811).

the chief ingredient, is being now largely manufactured and is fairly cheap, while timber is getting scarcer and dearer, and it is reasonable to infer, that concrete houses will be the houses of the immediate future. What has kept them back hitherto has been the lack of expeditious modes of erection, and lack of suitable design, making them expensive and plain. These disabilities are now in a fair way of being overcome.

An Acoustic Question.

When the Wellington Town Hall was built it was hoped that the acoustic properties were all they should be in the big hall. If they were not, one trembled for the sound of the great organ the Council had determined to instal. It was soon discovered that when the hall was empty there was a troublesome echo, and that when full the acoustic properties were just about the right thing. A suggestion was made then that a system of wires might make things right. Nothing was done. Complaints, therefore, multiplied on nights when the seats were not all occupied. According to the emptiness so were the complaints. The accumulation of these got at last a reference to the City Engineer, who made a recommendation which was, as we learn on going to press, accepted. The report advises that the most satisfactory way will be to hang a curtain on the back wall from the ceiling down to the cornice. Also to fill in the panels between the columns with frames covered with suitable material to absorb the sound waves. It was added that for small attendances it would be advisable to hang a curtain in sections (easily removable) under the baleony at the southern end of the hall. The whole to cost not more than £50. The cause of the echo is the reverberation caused by the deflection of the sound waves from the back wall towards the platform. This would not be affected by wires. At all events, better results would, the engineer thought, be obtained by his plan. The Council voted the £50 and we shall see what we shall see. The idea is hopeful.

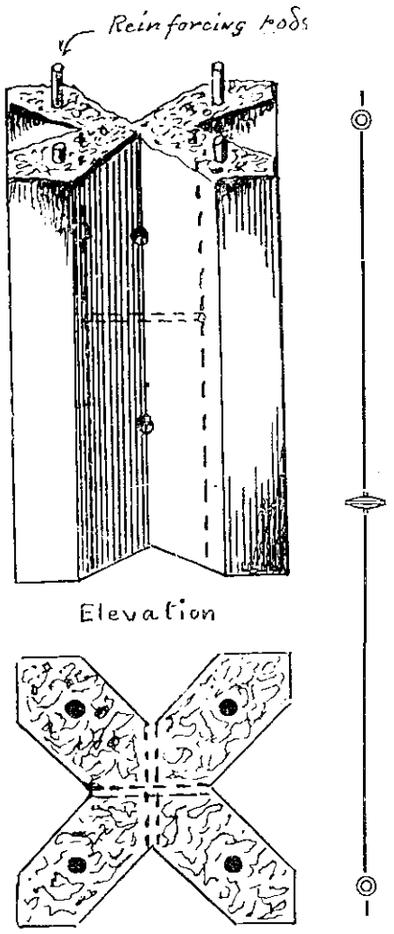
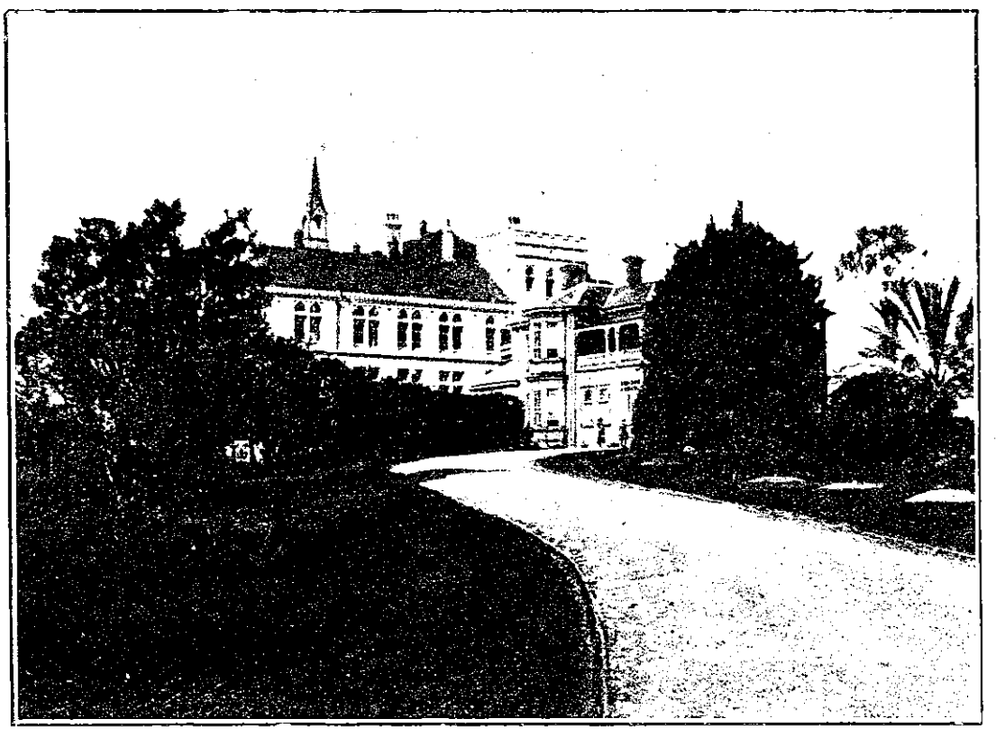
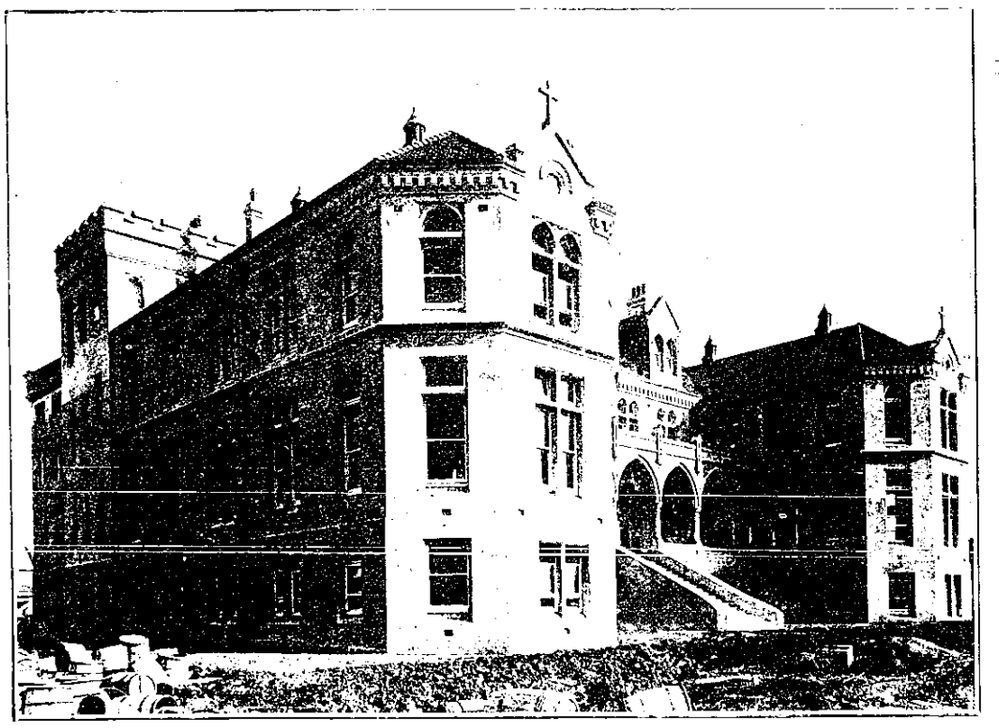


Fig. 1. Plan



SACRED HEART CONVENT, REMUERA, AUCKLAND. E. Mahoney & Son, Architects.



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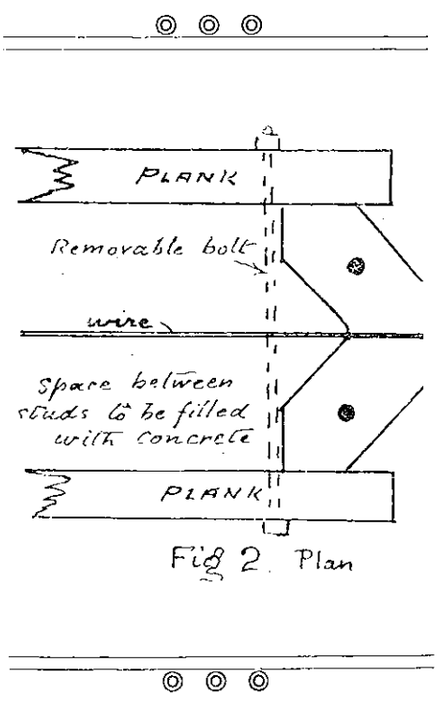


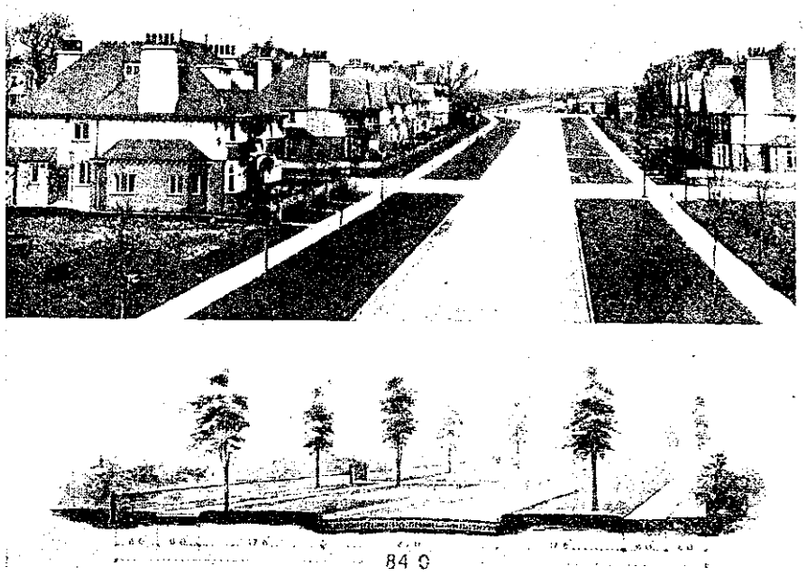
Fig 2 Plan

Town Planning.

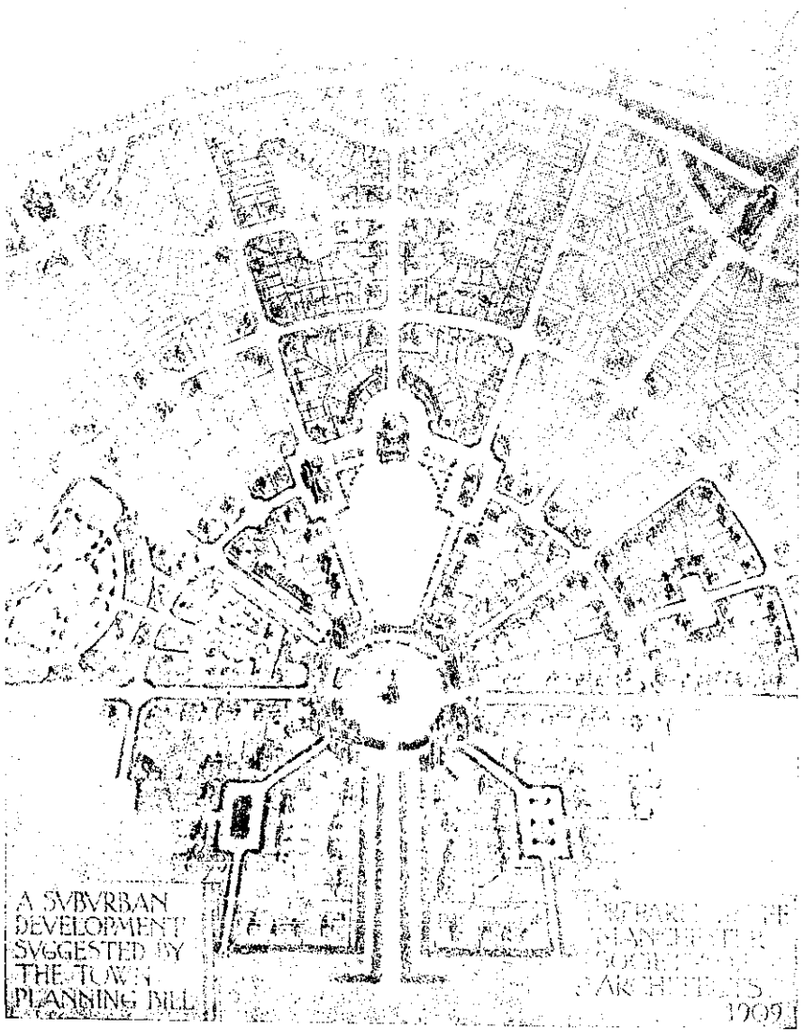
By S. Hurst Seager, F.R.I.B.A.

[Continued from August Issue, page 771]

The dominant fault in all our towns is the absence of any civic centre. In mediaeval towns there was nearly always a large open space round which the civic buildings were grouped. This space became the market square on market days. It was always apart from the main thoroughfares, so that the life of the place itself was not interfered with by through traffic. That is a principle which should guide us always in arranging our city open spaces. It must be recognised that a city is a place for work. There should be resting spaces of beauty within it, but the recreation or purely ornamental spaces should be quite apart from civic life. The very great mistakes which have been made in many of our towns are the result of not following this principle. In Christchurch, for instance, there is a large open space, Cathedral Square, so placed that it divides the town into two parts, and necessitates the main traffic passing through it. The consequence is that it has become a centre of traffic and tram service, thus altering entirely the character its founders intended it should have. It should undoubtedly have been placed off the centre of traffic so that it might have become as an oasis in the whirl of modern life around it. In Ashburton and Palmerston North also the same mistake has been made of forming gardens in the centre of the town, dividing it into two parts, necessitating a long and exposed walk from one part of the town to the other. The shops surrounding these large open spaces are also to a certain extent unprotected and the streets round them being lighted on one side only they never present the bright and cheerful attractive appearance which a street of shops should. The same effect is produced when the street is far too wide for the traffic and the buildings which line it. A street should always be proportionate in width to the height of the buildings likely to be built there. Those streets have the best appearance in which the height of the buildings is two-thirds the width of the street, so that, if the street is 66 feet wide, the buildings should be about 44 feet. This is about



QUEEN'S DRIVE, MOSSLEY HILL, LIVERPOOL, SHOWING 25FT. ROADING WITH GRASS INTERVENING BETWEEN ROAD AND FOOTPATH.



A SUBURBAN DEVELOPMENT SCHEME PREPARED BY THE MANCHESTER SOCIETY OF ARCHITECTS.

the height of ordinary three-storey buildings. But if these or even lower buildings are placed in a two chain street, as they are in Invercargill, an impression of desolation is at once created. This impression of desolation can be removed by planting avenues of trees. We make a pleasing promenade, but we rob the street of the businesslike character that streets devoted to shops should possess. In many European towns, as Paris, Berlin, Zurich, Frankfort, etc., trees are planted along the edge of a 20-feet footpath, and under these trees seats are often placed, and in some cases tables and chairs opposite the restaurants. This has a pleasing effect, and the foot passengers being nearly under the trees, the view of shops on the opposite side of the road is not impeded to the same extent as when rows of trees are planted down the centre of the roadway. Wherever, therefore, this feeling of desolation exists, success will follow the adoption of one or other of these methods. The trees must be carefully chosen. They should be deciduous. Plane trees appear to be the most satisfactory.

It cannot be too often insisted that ill-designed and ill-built towns cannot be improved by placing works of monumental art within them. The effect which might be produced by any noble work of art is lost immediately by its sordid environment.

Drury's fine statue of Queen Victoria, opposite the wharf in Wellington, has for its background huge signs on which are displayed the merits of somebody's beer and the excellent quality of certain food stuffs. The absurdity of the position has, I believe, become fully realised, and I understand that it is now proposed to remove it to a more suitable one. Monu-

ments of that kind should not be in our places of work, but in our places of rest, where their full effect can be felt. I contended that this principle should be followed when selecting a place for the Queen's statue in Christchurch. But the mistaken view was held that a statue should be placed where it would be most often seen by the citizens, forgetting that that which is always seen is never noticed. These views were admirably expressed by a writer in the Christchurch "Star," who wrote:—

"Not in the dusty, roaring street,
That honoured form should be
Where endless tramp of hurrying feet,
Passes unceasingly.

Where all is anxious push and strife,
As thousands jostle by,
Till the image wrought conveys no thought
To the over-burdened eye.

No, choose our fairest scene for rest,
'Mid tree, and flower, and sod,
For her who ever loved the best—
The wondrous works of God.

Where all is holy, quiet and peace,
From din and strife apart,
And the lessons taught by the image wrought,
Will sink into the heart.

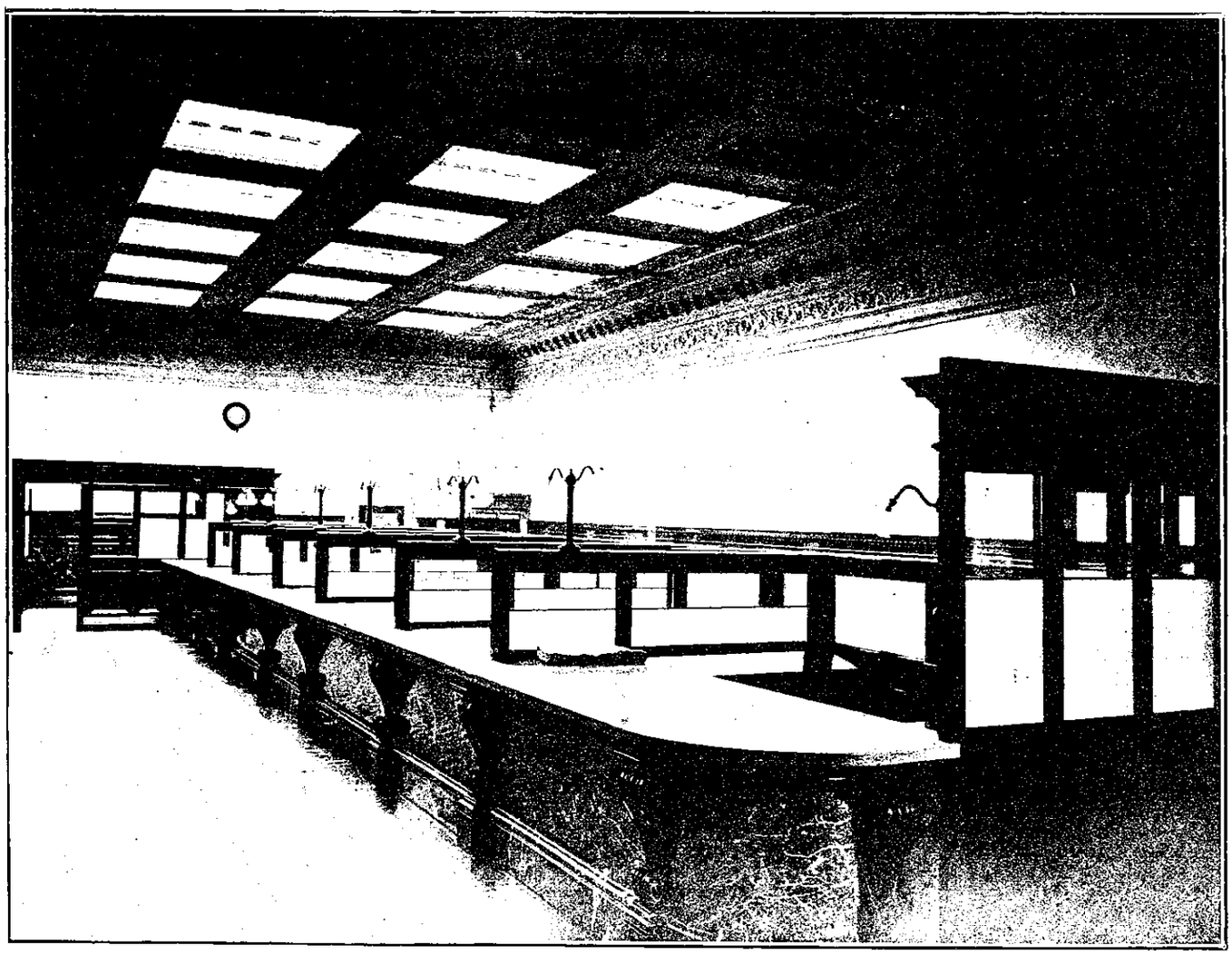
Those lessons of a noble life,
Which shine through care and pain,
In all the years which Fate-storms rife
Of that most glorious reign.

So shall each gazer, for her sake,
Feel patriot impulse swell,
Till those lessons caught from her image wrought
Shall serve our Empire well."

This might apply to all memorials of those not directly associated with the city in which the monuments are placed. A memorial, whatever its form, erected solely in honour of pioneers, or of men who have been associated with the work of advancing the interests of the city, would rightly be set up in the heart of the city their courage and industry has helped to build. We honour them for the work they have done and their memorial would be an incentive to labour as they laboured for the welfare of the community. The emotions their memorials would create would be wholly in accord with those created by the hum of industries and the bustle of life around them. But even in cases of this kind spots in the city must be chosen free from any sordid surroundings. The environment should be formed of the best and most worthy buildings the city has erected. Where possible, they should be designed as the centre of interest in the facade of a building a building devoted in each case to the purposes with which the names of those commemorated are associated. This is much more impressive than the isolated statue.

MILAN—GALLERIA VICTOR EMANUELE.

Much may be done to beautify an existing town by the formation of arcades. Waste back yards and spaces in the centre of building blocks could often be utilised in this way to the great improvement and healthfulness of the town. I admit that some erected in Australian cities have not been a great success; but where they have failed it has been because they have been ill-designed. To cram a lot of little, ill-lighted shops along a narrow passage does not form an "arcade" nor add to the beauty of the city. Those who have seen the arcades at Naples, of Milan, and elsewhere, know what attractive centres of interest in civic life they may become. It would require a long series of articles to even touch upon the many problems involved in the subject of Town Planning. But it cannot be too often insisted that



INTERIOR OF AUCKLAND SAVINGS BANK. Edward Bartley, Architect.

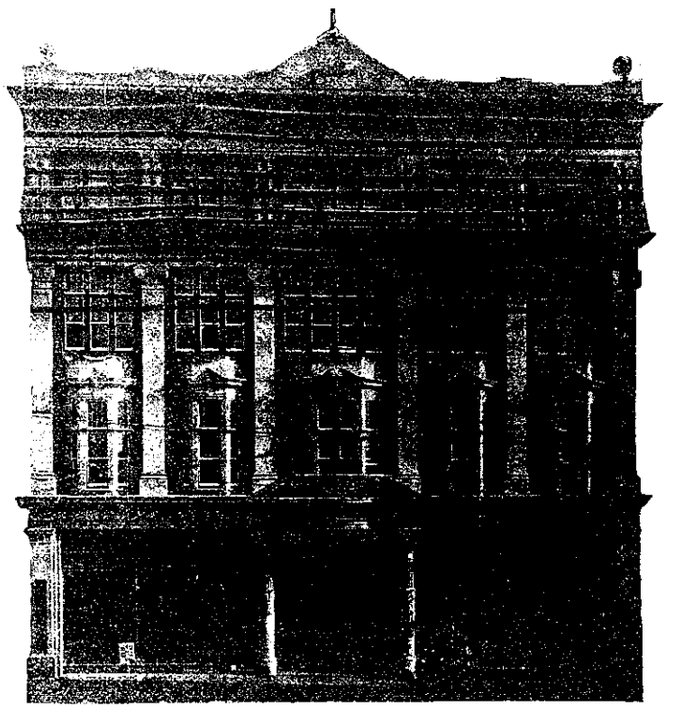
the first requirement is that citizens should take enough unselfish interest in their cities to free them from the disfigurements which now exist. When this is done the road will be clear for development in accord with the best modern examples of civic art.

When the late Mr. Dick was enumerating the good points of a cottage he was anxious to take, some one said the place was not big enough to swing a cat in. But he said he didn't want to swing a cat in it. It may be thought, therefore, that vulgarity will never be achieved because no one wants to be vulgar. But towns and villages do get vulgarised nevertheless. Some people without knowing it enjoy vulgarity for its own sake. If inhabitants they feel more at home the deeper the place sinks into vulgarity. They are like the horseman who, getting into a bog up to the saddle girths enjoyed the fun when the boy told him he would find hard bottom further down. "Building News."

Our Illustrations.

Residence and Professional Rooms of Mr. Thos. Fogg, Dentist, Corner Park and George Sts., Dunedin (p. 807).

This building is erected on a flat-iron shaped piece of ground, our picture showing the elevation to George Street. The accommodation provided for is as follows: — First Floor.—Professional rooms—Surgery, 20ft. 3in. x 17ft. 6in.; waiting-room, 16ft. x 14ft.; patients' room, 10ft. 6in. x 6ft. 6in.; workroom, 12ft. x 6ft. 6in.; patients' hall, 12ft. x 10ft. Residence—Entrance hall, 11ft. 3in. x 23ft.; dining-room, 20ft. x 15ft.; sitting-room, 16ft. 6in. x 12ft. 6in.; kitchen, 16ft. x 15ft.; scullery, 10ft. 3in. x 8ft. 6in.; pantry, 9ft. x 6ft. Second Floor.—Drawing-room, 20ft. 3in. x 17ft. 6in.; bed-sitting-room, 16ft. x 12ft.; five bedrooms, average size 14ft. x 14ft. In the attic a large space is available, with an observation tower on the corner.



STRAND ARCADE, AUCKLAND. E. Bartley, Architect.

Convent of the Sacred Heart at Remuera.

This building is of brick with hollow walls and tiled roof, and is 115ft. long overall and 101ft. deep. It consists of two principal floors with attic, and basement. The external walls are plastered and the interior ones are finished in Kean's Cement. The joinery and dado work are in oiled heart of Rimu. The rooms on the ground floor are 14ft. in height, and it has a recreation-room and study both 55ft. x 25ft., two class rooms 23ft. x 20ft. and 20ft. x 12ft. 3in. respectively, a library 20ft. x 13ft. 6in., and another class room and refectory which can be thrown into one by means of folding doors and make a large room of 81ft. x 20ft.; there is also a room for the Mistress General and lavatories and stores room.

The principal means of communication on this floor is an 8ft. tiled corridor with staircase up and down at either end. The rooms on the first floor are 13ft. high, and it has the chapel, 55ft. x 25ft., and the sacristy, two large dormitories 81ft. x 20ft. and 60ft. x 20ft. respectively. An infirmary 25ft. x 18ft. 3in., with bath-room, pantry, pharmacy, 3 bedrooms, lavatories, and a studio.

The upper floor has a large dormitory of 81ft. x 24ft., with 2 bedrooms and lavatories, the dormitories all have screens forming cubicles.

The rooms in the basement are 10ft. 9in. in height, and a part of it is below ground; it has the dining-room 41ft. x 20ft., a recreation-room 25ft. x 25ft. 9in., kitchen, scullery, store-rooms, engine-room, coal cellar and general storage-rooms, and six small rooms for piano practice, with a special infant class room. Messrs. E. Mahoney & Son, of Auckland, were the architects, and Messrs. Grevatt & Son the builders. The total cost is about £15,000.

Savings Bank, Auckland.

The alterations and additions make this a new building, and a striking addition to the city architecture. The new building is three times the depth of the old, running, as it does, 155 feet right through to Lorne Street. There are three divisions, namely, the old three-story building facing Queen Street, largely remodelled behind the old facade, the banking chamber, of one story, entirely new, and a new three story building facing Lorne Street. The banking chamber is the talk of the visitors, who have of late been very numerous and interested. One of the finest in the Dominion, this room measures 82 feet by 30 feet, it is lighted by skylights, it has a handsomely decorated ceiling of fibrous plaster, walls of Kean's cement set off by a mottled Kauri dado combined with Australian cedar, the dark tint of the latter contrasting finely with the characteristic markings of the local type, and the floor is laid with Milton tiles completing a remarkably handsome effect. The feature of the room, however, is a marble counter running its whole length, displaying its rich colouring of alternate black Italian and red Australian, with top of grey

American, nearly four feet wide (3ft. 10in). This counter is divided into numerous compartments for the tellers, with a system of brass railing having the customary openings for business. In front the design provides three large marble desks for the convenience of the bank's clients, the desks to be mounted on brackets of brass. Behind the counter is a commodious arrangement of desks for the staff, and there are some splendid chandeliers for lighting either by gas or electricity. There is a fireproof strong room 25 x 14ft., commanded from the street through a plate glass panel, so that whatever burglary may be indulged in will have to be done in the presence of the public and police. Offices of various dimensions, a big board room grandly furnished, and all details of accommodation of up-to-date order complete the premises. The contract price was £6,365, the contractors being Messrs. Craig Brothers.

Strand Arcade, Auckland.

This is a very handsome addition to the street architecture of the Northern Capital. The first view does not impress one so much because of its similarity in appearance to its predecessor. But when one gets into the Arcade the fine effect of the splendid design is very striking. One realises at once, especially if he has seen other cities, that he is in presence of an ideal business Arcade, with accommodation for shops and offices. Solidity, elegance, roominess and brilliant lighting are the special characteristics. Fire danger has been reduced to a minimum, moreover, and the disposition of the various offices is as nearly perfect as designing can make them with the aid of the best modern examples. The outer walls are of brick, the whole of the interior work is ferro-concrete, so built that the whole structure is of monolithic character. The doors and the window sashes are the only inflammable material throughout. The doors are punctuated by galleries running the whole length of the building, brilliantly lighted by the light-well, which practically runs the length of the roof. These galleries are broad and handsomely designed, and they are set off admirably by the various ornate bridges spanning the arcade, which will be found in addition most convenient to the traffic saved from the need for long walks between opposite offices. The plaster work is a notable feature of the interior decoration, floated in cement and completed in "keens." The block is a story higher than the one it replaces, and has been carried up to the height of 90 feet; while the distance between kerb and pediment is 68 feet. The office accommodation is considerably larger than it was in the former building, and the ventilation and lighting throughout, together with all modern requirements, are very good. The Queen Street front is of Melbourne brick, with plastered facings, and a wrought iron rail balcony along the upper floor. The pavement of the Arcade is tesselated, the bases are granite, the shops are on the ground floor, the offices on the others, the lighting is gas and electricity, and there are numerous lifts, of course all of them electric.

DAMP ROOFING OF MODERN BUILDINGS

(Continued from page 778.)

R.I.W. 232 damp-resisting paint is intended for the inside of the exposed walls of brick buildings prior to plastering. By the use of "R.I.W. 232" all forms of lathing may be done away, all chances of any decay of wood or metal eliminated by not using them, and the building is rendered absolutely damp-proof. "R.I.W. 232" remains tacky for a period of about three months, but should not be exposed direct to the sun or the elements. It can be plastered on 24 hours after its application.

Toxement (patented) is a waterproof material, in powder form, which, when mixed to the extent of two per cent. of the neat Portland Cement used, will absolutely waterproof concrete for floors. foundations, elevator and boiler pits, cement, stucco, etc.

Toxement produces a distinct chemical reaction between cement and itself, which physically fills up all voids. In thirty days this reaction is complete, after which time the concrete or cement mortar is waterproof up to fifty pounds pressure per square inch.

Toxloxpore is a clear colourless liquid for waterproofing brick or limestone. It makes a porous red brick waterproof without changing its colour or the artistic effect of a natural brick appearance.

The problems set out above are, many of them, just coming into existence in Australasia, and building on the experiences of other countries, there is no reason why the steel and concrete work of our buildings should not be made to last for all time, or why our materials should not be made proof against decay of all kinds.

Over 10,000 buildings in the United States and Canada have now been treated without a single failure, and so great is the trade of Messrs. Toch Bros. growing that they have recently acquired a site in Canada, and this year will erect new works fitted with the latest technical plant for manufacturing their specialities.

TENDER NOTES

Bathing building, with necessary enclosures in Queenstown Bay. Plans, etc., at office of Queenstown Borough Council. Tenders close September 7.

Tenders wanted for residence at Epsom, September 1. A. Jones, architect, 119 Queen St., Onehunga.

Tenders are invited up till 4 o'clock, Friday, for additions, etc., to house at Ellesmere. Drawings, etc., England Bros., 143 Hereford St.

Tenders for erection of house in Hirst Avenue, Devonport, will be received at the office of Mr. W. A. Holman, F.N.Z.I.A., 305 Victoria Arcade, on Tuesday, 5th September, 1911.

Tenders for erection of a residence, Ponsonby, will be received until noon on Tuesday, 5th September. J. Currie, Camden Chambers, Queen Street, Auckland.

Tenders for the erection of a residence, Lake Takapuna, will be received until noon on Monday, 4th September. J. Currie, Camden Chambers, Queen Street.

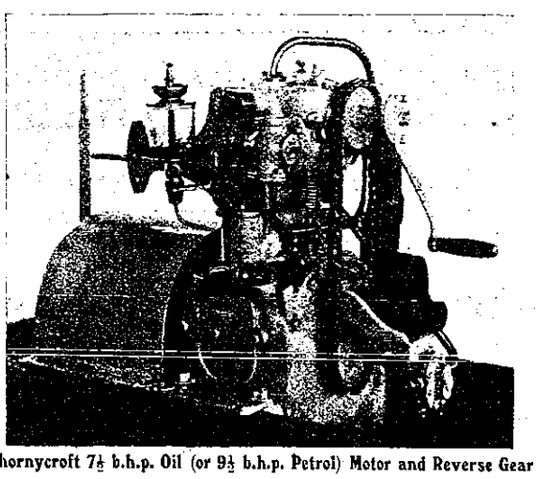
Tenders are invited for painting an eight-roomed house at Buckland.—Apply Buckland Store.

Tenders will be received until noon of September 7 for the erection of a residence (wood) at Green Island. Plans and specifications may be seen at my office, Edmund Anscombe, 134 Princes Street, Dunedin.

Tenders will be received until noon, September 1, 1911, for the erection and completion of house in wood, Bath Street, Ponsonby. Plans and specifications at the office of Mr. Fred. Souster, Nos. 41 and 42, Security Buildings.

Tenders are invited for erection of large residence in wood, Pah Road, Epsom. Plans and specifications at the office of Mr. J. Park, Holmes' Buildings, Onehunga, where tenders close on September 2, 11 a.m.

Tenders are invited for the erection of a Town Hall and Borough Offices for the Miramar Borough Council. Plans and specifications may be seen at the office of Mr. Gray Young, 217 Lambton Quay, where tenders close on the 4th day of September, 1911, at noon.



Building Notes

WELLINGTON

The following building permits have been received and approved by the City Engineer, Wellington:—

From 26/6/11 to 11/7/11—32 applications for permission to erect, 26 examined and approved. City District, £8577; Melrose District, £4152.

From 11/7/11 to 25/7/11—32 applications for permission to erect, 26 examined and approved. City District, £4082; Melrose District, £1782; Northland District, £375; Onslow District, 445.

From 25/7/11 to 8/8/11—26 applications for permission to erect, 25 examined and approved. City District, £2371; Melrose District, £4441; Northland District, £10; Wadestown District, £246.

* * *

It has been pointed out to us that an error appeared in our May issue in a description of a house built for Mrs. McLachlan, of Mount Eden. We should have stated that the half-timbering in Californian Redwood was treated with brown creosote stain.

The special attention of our architect friends is again drawn to another competition, with a premium of £25 for a competitive design for the Girls' Training Hostel at Christchurch. Designs to be in by September 16th. Conditions and particulars to be had on application to the College offices, J. H. Howell, B.A., B.Sc., director.

A two-storeyed Public Library, costing £1100, is to be erected (from plans already prepared) by the Dunedin City Council.

Mr. E. R. Wilson invites tenders for alterations to Messrs. Dalgety & Co.'s stores at Invercargill; also additions to Messrs. Kingsland & Son's biscuit factory at Invercargill.

At New Plymouth the new Empire Theatre for Mr. Saunders has been commenced.

Mr. Chas. H. Roberts, of Invercargill, has work on at the Coronation Hall, Nightcaps, and the Union Bank.

Mr. O. A. Jorgensen has a large residence on for Mr. J. A. Riddell, at Rua Roa. The successful builder in competition is Mr. Thos. Rimmer, of Foxton.

We understand that Hastings has advanced so far with its alterations to the Princess Theatre that plans are now being prepared.

Rotorua is to have a new Isolation Hospital, and tenders will probably be called for at an early date.

There being so small an attendance at the meeting of the governors of the Waitaki High Schools, the tenders which were then to have been opened, have been held over until the next ordinary meeting.

It is worth noting that the electors of Christchurch North have decided to build a large hall and not any more small ones.

We are glad to learn from the "Southland Daily News" of the activity in the building trade in Invercargill, the amount of £17,090 in excess of last year for a period of four months must be very gratifying to those interested in the trade, and when we learn that heaps of applicants for houses still have to go into lodgings, as no houses are available, this large sum does not appear to be too much, but go to prove that what is being done is actually required, and the result of shrewd business foresight.

Among the building permits approved by the City Engineer last week are to be noticed three houses in South Road for Mr. W. F. Eggers, a motor garage in Thompson Street for Mr J. Kirkcaldie, a house in Ohiro Road for Mr. C. Eggie, a gallery to the Skating Rink in Coutts Street for Messrs. Riley and Matson, a church in The Crescent for the Presbyterian Trustees, a house in Onepu Road for Mr. F. W. Boyd, a house in Hataitai Road for Mr. P. O'Kane, a house in Upper Rata Road for Mr. W. Sneddon.

Messrs. Percival & Messenger, of Inglewood, report that tenders are invited for additions to the Freezing Works at Moturoa, New Plymouth, for the Taranaki Producers Freezing Works Co., Ltd. The plans, etc., are to be seen at their offices or at the office of the latter at New Plymouth. Tenders are to be in by the 11th inst. and sent to the Company's office, Currie Street, New Plymouth.

Mr. John S. Swan, M.R.S.A., of Kelburne Chambers, requires tenders by the 4th inst. for the erection, additions, etc., to houses at New town. Drawings and specifications are to be seen at his office.

Mr. John T. Mair, A.R.I.B.A., reports that former tenderers for work to be done for the Upper Hutt Town Board are invited to submit tenders for modified plans, drawings of which may be seen at the offieces of the Board, Upper Hutt, and at his office at 16 Stock Exchange Buildings.

AUCKLAND

Messrs. WADE and WADE report:—Plans being prepared for following:—Brick two-storeyed residence, Symonds Street, Auckland; Wooden bungalow, Dargaville. Additional storey to Grand Hotel, Auckland, involving expense of £9000; new lifts and general re-modernising. Five-storeyed brick and re-inforced concrete building, Queen Street, Auckland, for Messrs. Arthur Eady & Co. Plans for re-modernising Auckland Turkish Baths, with three-storeyed brick store adjoining. Plans for two-storeyed residence, Remuera. Plans for additions to Hotel Mon Desir, Takapuna. Plans for alterations and additions to a bungalow, Takapuna.

CHRISTCHURCH

Mr. L. ROY SMITH reports the following contracts:—New Council Chambers, Lochiburn, for the Paparua County Council. This building is of classical design, and is to be built of brick, cement faced. The building will be replete with every convenience, such as lavatories, septic tank, strong rooms, etc. The contractors are Messrs B. Moore & Son. Residence, Cashmere Hills; C. J. Corkill, builder, £500. Residence, Idris Road, Fendalton; £700; C. J. Corkill, builder. Residence, Shirley; £680. New homestead, Greendale; W. H. Winsor, builder; is now nearing completion,

FIFTH PRIZE COMPETITION.

With a view of being useful to Motorists, and people using the roads of this country, a PRIZE OF TWO GUINEAS is offered for the best account of

A TRIP FROM WELLINGTON TO NAPIER BY ROAD.

The closing date for this story will be September 10th, and the winning story will be published in our Special Motor Number in October. Accuracy with regards to details essential. Should a map or photos be deemed necessary they will be published if sent. Stories should be written for the use of people unfamiliar with the road, and contain as much useful information as possible. Misleading corners and dangerous places generally to be pointed out.

SIXTH PRIZE COMPETITION.

Same as above, for

A TRIP FROM CHRISTCHURCH TO DUNEDIN BY ROAD,

but closing date to be Oct. 10th, and to be published in a later issue.

Patents

P. R. CLIMIE

(Continued from May issue, page 645)

Of course it is not and never has been disputed that when claimed as the result of a particular process or mode of manufacture, itself new, the product so produced is protected. As an example of an unpatentable product, it might be mentioned that a man could not patent a machine-made cigarette as against a hand-made article.

In class 5, new or improved processes, with or without special machinery, it is obvious that if the result or product of a process is good subject matter, a new or improved process itself, whether applied to the making of a new product or to the manufacture of an old product, is equally good subject matter.

Finally, with regard to class 6, a new principle coupled, with a mode of carrying the same into effect, it has again and again been laid down that a principle by itself cannot be patented; thus Harvey could not have obtained a patent for his discovery of the circulation of the blood. One of the simplest and best-known instances of a patentable invention consisting of a principle coupled with a mode of carrying it into effect, is that of the hot blast. Prior to the date of Neilson's patent, iron smelters had used a blast of cold air to blow up their furnaces. Neilson's improvement was that he heated the blast and he referred in his specification to a heating box as a means of effecting this object. Had he not referred to a means of heating, there is not the least doubt that his patent would have been invalidated, although the least intelligent of iron masters, when once told what the object of the invention was, would have had no difficulty in constructing at once a more or less efficient heating means. Neilson would have been astounded if he had been told that the patentable part of his invention lay, not in the grand secret of heating the air blast, but in the self-evident heating means which had scarcely given him any trouble to devise, and had called for the exercise of no invention at all.

We will now proceed to a brief consideration of the essentials of subject matter, which are: Invention, Novelty and Utility.

Broadly speaking, invention means the using of a man's intelligence, reason and brains so as to evolve something out of the beaten track, and not noticeable to the ordinary mind. The question as to whether there is any ingenuity in the subject matter of a patent is a question of fact which depends on a true view of all the circumstances.

Thus, the argument that the improvement was obvious and the advance slight may be successfully met, or at least combated, by showing that rival manufacturers had never thought of the so-called obvious modifications.

As to the question of invention, where a device is new and useful, very little will suffice to support the patent. To quote the words of Lord Halsbury: "No smallness or simplicity will prevent a patent from being valid." Thus in the case of Hayward versus Hamilton, the invention consisting of a combination of pavement light and prism, differing very little from what had been used before but giving materially increased useful results, was upheld as involving invention.

Mere analogous application, however, is not invention. Thus a fish plate, used to connect wooden beams, cannot be patented for connecting iron rails. Whenever the Court finds a real or appreciable germ of invention, however small, it will uphold the patent. Thus the substitution of a round wick in a lamp for a flat wick was approved as patentable.

The next essential of valid matter is novelty, the grant of a patent being upon the assumption that it is a new manufacture which the inventor is giving to the public; anything which disproves the novelty tends to invalidate the grant.

The novelty of every part claimed must be sustained in an action for infringement, and if it should transpire that any portion of the claimed matter is old, the whole patent is invalid, at least until amendment of the specification.

The laws of various countries differ in the views they take of novelty, but in all cases the broad principle is the same; namely, that the grant is made to the inventor in consideration of his placing the public in possession of something which up to the time of his invention was unknown in the country.

Prior use by members of the public, or, even by the inventor himself, if effected in a sufficiently public manner, will destroy the validity of a patent granted after the date of such use in this country. Mere experiment in his own workshop, or mere confidential disclosure to or experimental use on his behalf by another, will not destroy the inventor's right. The authorities go to show that the inventor is allowed reasonable latitude in testing the usefulness and practicability of his invention before patenting, so long as those experiments do not disclose such invention to others who are not in confidential relationship to him.

But this doctrine must not be pushed too far. The inventor must not, even, experimentally, use his invention for profit before the date of his patent. Thus, in a case in which it was proved that some flour, treated according to a patented process, was sold about three weeks before the date of the patent, such patent was held invalid, although, of course, nobody could say that the flour disclosed the invention.

Public use might be brought about by exhibiting a sample of the invention and by offering it for sale even though no sale was effected, or by manufacturing an article and storing it in a warehouse for purposes of sale.

The remaining element in subject matter is utility. By utility is not meant the mere capacity to be put to a useful or profitable purpose, but rather usefulness for the purpose indicated by the inventor.

As an example of this, we will suppose that the inventor claims that his invention serves a certain purpose, and it is proved that it will not serve that purpose, the patent could be declared invalid through want of utility, irrespective of any commercial value it may possess. It is therefore, a fatal mistake for an inventor to make any rash statement in connection with the application of his invention.

Thus in the case Easterbrook versus the Great Western Railway Company, it was shown that the plaintiff's railway signal lock was, under certain conditions, a possible source of danger, and the patent was in these grounds held void.

Patents

The following list of applications for Patents, filed in New Zealand during the month ending August 17th, 1911, has been specially prepared for PROGRESS.

29507—Johnstone, W. L., and Hosking, A., both of Palmerston North: Milk heater, etc.
29508—Norrie, A. E., Christchurch: Decoy.
29509—Bartlett, R. H., Kaponga: Milking machine bucket.
29510—Player, C. E., Auckland: Gate, etc., fastening.
29511—Dennison, M. U., Dunedin: Dress-shield.
29512—Porter, G., Dunedin: Fire alarm.
29513—Pirani, S. G., Melbourne, Vic.: Tire cover.
29514—Booth, G. T., Christchurch: Cream separator driving gear.
29515—Booth, G. T., Christchurch: Teat cup.
29516—Davies, G. W., Wellington: Explosive.
29517—Goodhart, G. C., Willows, Eng.: Internal combustion engine.
29518—Fraser, W. A., Melbourne, Vic.: White lead.
29519—Young, A. E., and Holmes, G. G., both of Christchurch: Envelope sealing.
29520—Charley, J. J., Malvern, Vic.: Vehicle and carrier.
29521—Marsom, W. J., Normanby: Gate.
29522—Olson, C. F., and Harrington, J., both of Petone: Egg tester.
29523—Roberts, A. H., Brunswick, Vic.: Tire rim.
29524—Gesellschaft fur Drahtlose Telegraphie m.b.H., Berlin, Ger.: Producing electrical oscillations.
29525—Gesellschaft fur Drahtlose Telegraphie m.b.H., Berlin, Ger.: Producing electrical oscillations.
29526—Wilson, J., Auckland: Concrete structure.
29527—Grace, T., Sydney, N.S.W.: Wheel.
29528—Banes, E. E., Sydney, N.S.W.: Sulphide ore treatment.
29529—Banes, E. E. Sydney, N.S.W.: Ore furnace tuyere.
29530—Best, P. H., Nelson: Milking machine teat cup.
29531—Reeves, W., Henderson: Swingletree.
29532—Toon, C., Christchurch: Gas-main closing.
29533—De Montalk, R. W., Auckland: Studs and boards.
29534—Simpson, R. M., Wellington: Centrifugal separator.
29535—Behrns, A., Rakaia, Turnip digger and slicer.
29536—Townley, J., and Sharples, W. J., both of Gisborne: Extension table.
29537—Powell, J. C., Timaru: Window showstand.
29538—Walker, J. A., Auckland: Closet pan-cover.
29539—Fountain, W. G., and Paterson, W. J., both of Hamilton: Milk-releaser.
29540—Andrew, N., Wanganui: Generator and washer.
29541—Blythe, A. J. S., Te Awamutu: Floor-polish.
29542—McGill, D., Petone: Flax treatment.
29543—Hogg, W. M., Lawrence, and Hogg, F. M., Evan's Flat: Plough coulter.
29544—Bevan Lock Nut Company, Limited, London, Eng.: Nut-lock.
29545—Westinghouse, G., Pittsberg, U.S.A.: Power-transmission mechanism.

For any particulars or copies of the drawings and specifications in connection with the above applications, which have been completed and accepted, apply to

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PROGRESS Office.
10 Willis Street,
Wellington.

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